IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW

OF

APPLIED MYCOLOGY

VOL. XVI DECEMBER 1937

ZAPROMETOFF (N. G.) & MIKHAILOFF (E. N.). Болезни Шелковицы. [Mulberry diseases.]—*Тр. Ср.-Азиат. Научно-Исслед. Инст. Шелков.* [*Trans. Cent.-Asian sci. Res. Inst. Sericult.*], *Tashkent, 1937*, 14, 50 pp., 16 figs., 2 graphs, 1937. [English summary.]

According to Zaprometoff, the results of investigations in 1935 in the neighbourhood of Tashkent, Russian Central Asia, showed that mulberry blight (*Bacterium mori*) [*R.A.M.*, xvi, p. 73] attacks all mulberries of a shrub-like habit of growth, while semi-standard and standard trees are usually immune; among the former the most susceptible was the Japanese species *Morus kagayamae*, while the Japanese *M. bombicis*, *M. multicaulis*, and *M. alba* came next, and the local variety Khasak of *M. alba* suffered the least. The severity of the disease was considerably increased by absence of direct sunlight and defective cultivation of the soil. Summer pruning of infected shoots, together with disinfection of the cut ends with formalin (1 in 100) proved to be an effective means of control against blight of the Japanese mulberries. Investigations have shown that the disease is widespread in Uzbekistan, and is also present in other mulberry-growing regions of the U.S.S.R., namely, Khirghizia, Tadjikistan, Bashkir Republic, Ukraine, North Caucasus, and Transcaucasia.

Mikhailoff gives an account of isolation and cultural studies which showed that the morphological, cultural, serological, and pathogenic properties of *Bact. mori* are strikingly constant, irrespective of the source of origin, nature of substratum, or age (up to three years) of the isolates studied. In nature it is frequently accompanied by a Gram-negative rod, non-pathogenic to the mulberry. Experiments showed that neither organism is pathogenic to the silkworm.

An account is further supplied by Zaprometoff of his studies on the leaf spot of the mulberry, caused by *Cylindrosporium maculans* (All.) Jacz. (syn.: *Septogloeum mori* Br. & Cav., and *Phleospora maculans* All.), which chiefly attacks the local (Khasak) shrub-like mulberry, while hybrids between the local and the Japanese varieties are apparently immune. Infection and intensity of the disease are favoured by crowded conditions in the plantations and lack of proper cultivation, and pruning retards the development of the trouble.

The pamphlet terminates with a list, compiled by Zaprometoff, of

23 mulberry diseases recorded up to 1935 in the neighbourhood of Tashkent and in the Fergana valley, including *C. moricola* Jacz. (syn. *P. moricola* [(Pass.)] Sacc. [*Mycosphaerella mori*: ibid., xv, p. 67]), *Uncinula mori*, *Phyllactinia corylea* [ibid., xvi, p. 491], *Botrytis cinerea*, and ten non-parasitic diseases.

HEIM (R.) & BOURIQUET (L.). **Les maladies des Albizzia à Madagascar.** [*Albizzia* diseases in Madagascar.]—*Rev. Bot. appl.*, xvii, 190, pp. 405–412, 3 figs., 1937.

In this brief account of the diseases of *Albizzia stipulata* and *A. lebbek*, the two main shade trees of coffee in Madagascar, the authors state that in the Farahony valley in that island the former species was found in 1934 to suffer from a condition, the main symptom of which is the development at the base of the trunk of an abnormal cracking in the bark, usually extending up to 50 cm. above the collar, and either girdling the whole stem or occurring on one side of it; this condition is sometimes associated with a die-back of the crown, which may occur, however, without any cracking of the bark at the collar. Although the trouble was not seen before 1934, it is rapidly gaining ground; in 1935 up to 70 per cent. of *A. stipulata* trees were found to be attacked by it in certain localities. Diseased trees frequently showed the presence under the cracked bark of white or greyish mycelial fans, consisting of sinuous, rarely septate hyphae, 1·6 to 3·5 μ in diameter, surrounding nodules of a soft or liquid gum, and sometimes continuous with the mycelium of dead sporophores of a species of *Coprinus*, probably *C. radians* [*R.A.M.*, viii, p. 3], which is believed to be involved, possibly together with some other fungus, in the causation of the disease. An attempt to control the condition by the application of a 2·5 per cent. formol solution to the base of diseased or suspected trees, together with the removal of all infected material in the plantations, is stated to have given excellent results.

In the Ivoloina and Onibe valleys, to the north of Tamatave, *A. stipulata* is subject to a cankerous gummosis, usually fatal, which attacks trees of all ages. It starts from the base and works upwards, in the form of small cracks in the bark which increase in time and finally break up the cortex into small parallelipipeds; these drop off and leave the wood bare, so that dead trees appear as barkless skeletons. While the cause of this disease is not yet known, it is not believed to be physiological, the activity of a wound parasite appearing to be more probable.

In the Sambirano region, *A. lebbek* has been observed for a few years to be attacked by a serious cracking of the bark at the base of the trunks, associated with the exudation of gum, and a withering and shedding of the crown leaves; it is believed to be probably due to a *Nectria* species of the *ditissima* group, abundant fructifications of which were found on a dying tree.

WATERMAN (ALMA M.). **New hosts and distribution of Rehmiellopsis bohemica.**—*Phytopathology*, xxvii, 6, pp. 734–736, 1937.

Since the detection of *Rehmiellopsis bohemica* on *Abies concolor* in Massachusetts, Maine, and New York in 1933 [*R.A.M.*, xii, p. 408], the

fungus has been observed causing needle and twig blight on the same host and *A. cephalonica* in Rhode Island, on *A. lasiocarpa* in British Columbia, and on *A. balsamea* in Maine. Of seven other *A.* spp. exposed to natural infection by *R. bohemica* in eastern Massachusetts, only *A. nobilis* and *A. fraseri* contracted the disease, the former having previously been reported by Rostrup as a host of the fungus in Denmark (*Dansk bot. Ark.*, ii, 5, 1916), while the latter appears to constitute a new record.

Laughton (Élaine M.). **The incidence of fungal disease on timber trees in South Africa.**—*S. Afr. J. Sci.*, xxxiii, pp. 377–382, 1937.

Of the fungi recorded on *Pinus radiata* in South Africa, *Sphaeropsis pinicola* Speg. (syn. *Diplodia pinea* [*R.A.M.*, xvi, p. 219] and *D. megalospora*) is the most important, hail wounds affording entrance to the fungus, which, once established, is a vigorous parasite, girdling the stem, and causing the death of the trees. The pathogen has been found by Miss Lurie to enter the uninjured bud of the plant, but it does not penetrate the axis to any serious extent. Continued infection and dying back of the laterals increase the damage, but the tree usually sends out a new leader and recovers. Losses from the disease have restricted the tree almost entirely to the Western Cape Province, but in the Midlands and Eastern Cape Province there are well-drained soils where the trees have flourished in spite of infection and eventually completely recovered. Experiments by Miss Hancock, using seedlings of *P. radiata* grown with controlled supplies of water, showed that growth is impaired when soil moisture is considerably reduced, or increased to a high water content, the range being much more restricted than that tolerated by *P. patula*. Inoculations on the latter resulted in very little damage, whereas the former host was readily infected and when grown under unfavourably wet or dry soil conditions the attack was severe. The fungus causes blueing of timber of *P. radiata* even in the Western Cape Province, and is indeed the main cause of blueing throughout the country. *Ceratostomella pilifera* [ibid., xvi, p. 578] has been found on logs in the Eastern Transvaal, but the fruit bodies contained no spores.

During the past four years a dying-off of *P. pinaster* has occurred in Cape Peninsula, the trees wilting and turning brown, especially at the apex, within a week, death usually taking place in a fortnight. *Rhizoctonia lamellifera* [ibid., xvi, p. 683] was found to have invaded the main root, but the final dying-off is attributed to drought effects on the superficial feeding roots. A similar infection was observed in older trees of *P. muricata*, *P. echinata*, and one specimen of *P. radiata*.

An undetermined species of *Rhizoctonia* is recorded as affecting *P. pinaster* in the Eastern Transvaal, and a species of *Corticium* was found causing some mortality on seedlings of indigenous trees in the Knysna district, where whole groups of *P. radiata* and *P. pinaster* were killed off by a similar infection.

A species of *Diplodia* indistinguishable from *D. natalensis* [ibid., xvi, p. 219] occurred on *Acacia mollissima* in the Eastern Transvaal as well as Natal, affecting the whole root system and extending up the side of the stem to form heavy, black cankers. The fungus was readily isolated and formed fruit bodies in culture.

BAXTER (D. V.). **Some resupinate Polypores from the region of the Great Lakes, VIII.**—*Pap. Mich. Acad. Sci.*, xxii, pp. 275–296, 7 pl., 1937.

In this contribution [*R.A.M.*, xvi, p. 6] descriptions are given of six resupinate Polypores from North America and in addition the growth characteristics of 19 brown Polypores in culture are tabulated and discussed. The problem of distinguishing resupinate Polypores in culture is complicated by the fact that many distinctive forms appear in the 35-week-old litre flask cultures but are not apparent in cultures made in tubes on Petri dishes for periods up to four weeks. In spite of the variations produced, cultural characters can be used as supplementary to the morphological features of the fruit body itself in identifying these fungi. Of the species tested, *Trametes isabellina* is said to cause a sap and heart wood rot of fallen trees, particularly the lodgepole pine [*Pinus contorta* var. *latifolia*], in western North America.

RICHARDSON (N. A.). **Wood preservatives.**—*For. Prod. Res. Rec., Lond.*, 17 (Wood Pres. Ser. 3), iii + 13 pp., 1937.

In this concise account of the wood preservatives used in England, the author classes the products as (A) oil type preservatives, comprising coal tar creosote (British specifications for which are given) [*R.A.M.*, xvi, p. 581], coal tar, water gas tar creosote, wood tar creosote, petroleum oils, and waste sump oil; (B) water-soluble type preservatives, viz., zinc chloride, sodium fluoride, magnesium silicofluoride, copper sulphate, mercuric chloride, and certain arsenic compounds, and (C) solvent type preservatives in which the toxic chemical is dissolved in a volatile solvent. Notes are given on the various preservatives, and concluding sections deal with patented and proprietary products and the choice of preservatives.

BROWN (Mrs. M.). **Mine timber preservation.—Mine fungi.**—*S. Afr. J. Sci.*, xxxiii, pp. 383–389, 1937.

As a result of tests of various timber preservatives in mines [cf. *R.A.M.*, xv, p. 186] on the Rand it was found that timber impregnated with zinc sulphate plus sodium fluoride with dinitrophenol as a solvent showed within a fortnight of being installed an improved condition compared with untreated timber, and after 3½ years was in a very satisfactory condition, whereas untreated poles decayed within a year. In one series of tests, all the treated timbers were covered with lime, which had been borne by air currents from a lime mixer, and were completely destroyed within a year, indicating that factors other than fungal organisms influenced the destruction of the timber [ibid., xv, p. 622]. In localities with prevailing temperatures about 90° F. or over deterioration is slow, and untreated timbers only showed signs of decay after 2½ years.

Of the fungi involved, an apparently new species of *Merulius* severely attacked mine timbers not exposed to particularly damp conditions. *Polyporus rugulosus* occurs on timber in very wet situations and is common in some of the Central Rand mines and also in some of those on the East Rand. *Poria vaporaria* is found in some mines in localities

where the temperature ranges from about 68° to 72°, and *Coniophora cerebella* [*C. puteana*: ibid., xvi, p. 581] occurs at the same temperatures. *Paxillus panuoides* [ibid., xvi, p. 3] and *Polystictus versicolor* [ibid., xvi, p. 580] grow in some mines in Eastern Transvaal, and *Lentinus lepideus* has been collected in one of the Central Rand mines. A number of plantation fungi (including *Lenzites repanda*, *Stereum hirsutum*, *Polyporus gilvus*, *P. fruticum*, *Polystictus occidentalis*, *Ganoderma applanatum*, *G. lucidum*, *Trametes albotexta*, and a species of *S.* near *S. spadiceum* [ibid., xiii, p. 810]) also occur. Fungi normally regarded as destroyers of coniferous timber grow readily on hardwoods underground. In the mines, different fungi are to be observed on timber at different levels according to the temperature, *Schizophyllum commune*, *Lenzites trabea*, and the undescribed species of *Merulius* all being high temperature forms; *S. commune* is of no economic importance as it does not weaken the timber.

Eckbo (N. B.). **Forest products investigations.**—*S. Afr. J. Sci.*, xxxiii, pp. 362–372, 1937.

In timber preservation investigations at the Forest Products Institute, Pretoria West, since 1921 it was found that hardness of wood is no criterion of durability. Sapwood is readily decayed regardless of the species of wood, and only comparatively few and unimportant species have durable heartwood. *Acacia pallens*, *Faurea macnaughtonii*, *Pygeum africanum*, and five other indigenous species withstood decay for six years and are classed as durable, together with seven exotic species of *Eucalyptus*. Grade I creosote (American specification) [*R.A.M.*, xvi, p. 430] is most effective against decay, while zinc chloride (5 per cent.) is used for structures not in contact with the ground, and zinc chloride (3 per cent.)+arsenious oxide (1 per cent.) has given good results for superstructures of buildings where the arsenical salt is not objectionable. Creosote (80 per cent.) and crude oil (20 per cent.) is slightly cheaper than creosote and so far equally efficacious. In tests in progress at the Consolidated Main Reef Mines [see preceding abstract], timber treated with creosote, creosote and fuel oil (40 : 60), zinc chloride, arsenite of soda and fuel oil (1 : 100), and some other mixtures remained fairly sound to sound after nine years service.

Decoux (L.), Vanderwaeren (J.), & Roland (G.). **Recherches effectuées en 1936 sur la pourriture du cœur de la Betterave sucrière.** [Researches carried out in 1936 on Sugar Beet heart rot.]—*Publ. Inst. belge Amélior. Better.*, v, 3, pp. 187–192, 1937. [Flemish, German, and English summaries.]

In these further studies [*R.A.M.*, xvi, p. 149] Hilleshög sugar beets grown in pots containing sand, peat, and chemical fertilizer (*a*) with no added dressing, (*b*) with 1 gm. borax added, (*c*) 1 kg. calcium fertilizer (in the form of sugar factory scum containing 48 per cent. quicklime) which reduced the hydrogen-ion concentration from P_H 7·2 to 8·3, and (*d*) the borax and lime mixed, had, respectively, a sugar content of 18·1, 19·8, 18·1, and 20·3 per cent., and a sugar yield of 31, 35, 38, and 56 gm. per root.

In a field test with the same variety planted as early as 31st March,

1936, the highest yield (9,227 kg. per hect.) was obtained in the plots dressed with ammonium nitrate (125 kg. N. per hect.) and borax (20 kg. per hect.); applications of ammonium nitrate alone reduced the yield of sugar. The incidence of heart rot in this field in 1936 was negligible, whereas in 1935 the crop was severely affected, the difference being due probably to climatic conditions (154 mm. of rain in July in 1936, and 8 mm. in 1935).

JAMALAINEN (E. A.). **Juurikkaiden sydän- ja kuivamädän torjunta booripitoisilla aineilla.** [On the control of heart and dry rot in Beets with substances containing boron.]—*Maatalous*, xxix, 3, 4 pp., 1 fig., 1936. [Received September, 1937.]

The efficacy of boron in controlling heart and dry rot of sugar beet in Finland was demonstrated in an experiment in which the application of boric acid at the rate of 5 kg. per hect. reduced the percentage of diseased plants from 49·1 to 7·6 and increased the yield from 11·4 to 20·8 metric tons per hect.

HIRSCH (H.). **Enkele opmerkingen over het hartrot van de Suikerbiet.** [Some observations on the heart rot of the Sugar Beet.]—*Tijdschr. PlZiekt.*, xliii, 5, pp. 115–120, 1 pl., 1937.

The writer's inoculation experiments with *Phoma betae* [*R.A.M.*, xvi, p. 510], *Fusarium merismoides* [ibid., xv, p. 765], and *Cladosporium herbarum* on healthy sugar beets and those deprived of boron indicated that the former sustain no appreciable damage under normal conditions of cultivation, whereas in the latter the development of heart rot consequent on the absence of boron [see preceding abstracts] is accelerated by fungal infection. It may be concluded, therefore, that boron deficiency is the primary cause of heart rot, the symptoms of which cannot be induced by fungi unless the normal growth of the plants has ceased as a result of the lack of this essential element.

GORDIENKO (F. I.). Бактеріальний характер коренеїда Цукрових Буряків і боротьба з ним в умовах **1934** р. [Bacterial nature of the root disease of Sugar Beet and its control under the conditions that prevailed in 1934.]—ex *Збірник наукових праць по Захисту Рослин* [*Collection of scientific papers on Plant Protection*], pp. 63–68, Держ. Видавн. Колгос. і Радгос. Літер. УССР [Ukr. Publ. Off. Collect. & Co-op. Fmg Lit.], Kieff, 1936. [Received May, 1937.]

The author states that the warm and dry weather throughout the spring of 1934 in the Ukraine did not prevent a widespread and severe outbreak in May of that year of the root disease of sugar beet seedlings usually attributed to the activity of various fungi [*R.A.M.*, xiv, p. 281] under cool and moist conditions; in certain localities the disease destroyed up to 90 per cent. of the crop. Isolations from the diseased beet seedlings almost invariably failed to reveal the presence of such fungi as *Phoma betae*, *Aphanomyces levis*, and *Pythium de Baryanum*, but consistently yielded a number of bacteria, among which *Bacillus mycoides* [ibid., xvi, p. 676] was constantly represented. This organism, together with certain other bacterial strains, was experimentally shown

to be pathogenic to the beet seedlings, the greatest percentage of infection (50 to 60) being obtained with a mixture of four strains, including *B. mycoides*. Field investigations showed that the disease was most prevalent and severe on poorly cultivated soil, with a compact crust under the three or four superficial centimetres of loose soil. It is considered that adequate and deeper cultivation should be effective in preventing such outbreaks.

Kotchura (O. I.). Возбудители дырчатой пятнистости листьев Сахарной Свеклы. [Causal agents of the shot-hole leaf spot of the Sugar Beet.]—*Научн. Зап. по Сахарн. Промышл.* [*Sci. Notes Sug. Ind.*,] *Kieff*, [Grey Ser.], xiii, 5–6, pp. 170–175, 3 figs., 1937.

An account is given of a disease of sugar beets, first described in 1924 by Mouravieff under the name 'shot-hole leaf spot' from the Ukraine, and since found to be widespread in that country, where it is especially harmful to young seedlings, many of which are killed by infection of the hypocotyl. On the leaves the grey or brown, slightly translucent, irregular spots of varying size, surrounded by a darker and furrowed margin, develop during the whole vegetative period; the diseased tissues in time dry up and fall out; the spots were also observed on the stems, sepals, inflorescences, and seeds of affected plants. Isolations from diseased tissues yielded 12 strains of bacteria, two of which, namely, a species considered to be new to science and named *Bacillus butyricus betae*, and *B. mesentericus vulgatus* [*R.A.M.*, xiv, p. 356], were experimentally shown to be pathogenic to beet seedlings. *B. butyricus betae* is a rod, 2 to 6 by 1·2 μ, with rounded ends, occurring singly or in pairs; it is peritrichous, Gram-positive, facultatively aerobic, forming oval spores but not capsules. It liquefies gelatine, forms acid and gas from dextrine, levulose, glucose, saccharose, lactose, maltose, and mannite, peptonizes milk, reduces nitrates, but not litmus, does not produce hydrogen sulphide or indol, and hydrolyses starch. The bacillus was frequently isolated from the blackened central vascular bundle of beet seedlings collected in the field, and was shown to be able to cause root rot of beets. Of a number of soil-inhabiting bacteria which were tested, *B. mycoides* [see preceding abstract] was also shown to be able to cause a leaf spot very similar to the one described above on young beet seedlings. All the organisms entered the host tissues without wounding, presumably through the stomata. Cultural methods during vegetation are recommended against the disease, infection by which in the later stages of growth is usually followed by complete recovery of the affected plants.

Murphy (D. M.) & Pierce (W. H.). **Common mosaic of the garden Pea, Pisum sativum.**—*Phytopathology*, xxvii, 6, pp. 710–721, 2 figs., 1937.

The symptoms induced by common pea mosaic (pea virus 3) [*R.A.M.*, xv, p. 418; xvi, p. 722] on garden peas in Idaho range from severe yellow mottling and dwarfing (Alderman, World's Record, and Market Surprise varieties) to less intense mottling and general chlorosis (Alaska and Telephone). In the greenhouse blue lupins (*Lupinus angustifolius*), chick peas (*Cicer arietinum*), and grass peas (*Lathyrus sativus*)

inoculated with pea virus 3 developed apical necrosis (spreading throughout the plants in the two first-named) and severe foliar mottling, while common vetch (*Vicia sativa*) leaves were mottled and curled. Pronounced mottling and chlorosis were typical symptoms of infection on broad beans (*V. faba*) and sweet peas (*L. odoratus*), alsike clover (*Trifolium hybridum*) showed vein-clearing and faint mottling, while a definite yellow mottling characterized crimson (*T. incarnatum*) and red clover (*T. pratense*) [cf. ibid., xvi, p. 294]. Other plants shown by inoculation tests to be susceptible to pea virus 3 included *Desmodium canadense*, *Lupinus albus* and other species, *Medicago arabica*, *Melilotus alba* and its var. *annua*, *M. indica*, *M. officinalis*, *Phaseolus acutifolius* var. *latifolius*, and various species of *Trifolium*. Forty-four varieties of garden and 17 of field peas were shown by inoculation tests to be susceptible to pea virus 3, resistance to which, on the other hand, was manifested by American Wonder, Canners' Gem, Dwarf White Sugar, Early Bird, Horal, Hundredfold, Laxton's Superb, Little Marvel, Morse Market, Notts Excelsior, Onward, Perfection, Premium Gem, Rice's 13, Surprise, Thomas Laxton, White Marrowfat, Wisconsin Early Sweet, Zwaan's Banquet, Mackay, and Tom Thumb.

None of the 4,263 seedlings raised from seed collected from severely infected Alderman and Dwarf Alderman plants contracted mosaic, the transmission of which through the seed is concluded to be very exceptional. Pea aphids (*Illinoia* [*Macrosiphum*] *pisi*) fed on diseased peas and then transferred to 25 healthy Asgrow 40 plants communicated pea virus 3 symptoms to 16 of the latter within three weeks. The virus was found to be inactivated in Alderman peas by exposure to a temperature of 60° C., and no infection was obtained with inoculum aged for three days at 22°.

Purvis (E. R.) & Ruprecht (R. W.). **Cracked stem of Celery caused by a boron deficiency in the soil.**—*Bull. Fla agric. Exp. Sta.* 307, 16 pp., 3 figs., 1937.

In recent years cracked stem of celery [*R.A.M.*, iv, p. 393] has become more prevalent throughout the celery-growing areas of the eastern United States and Canada, often causing 50 per cent. loss of crop. The disease manifests itself by a brownish mottling of the leaf, first affecting the margins of the bud leaves. The stems are brittle and show brown stripes in the epidermis above the vascular bundles of the stalk. Transverse lesions appear above the vascular bundles and the broken tissues curl backwards and turn dark brown. The roots become brown, the laterals dying back and forming small knob-like appendages at their extremities.

In water culture experiments plants receiving no boron developed cracked stem, but recovery of diseased plants was effected by the addition of 1·08 p.p.m. boron. In field tests the application of commercial borax close to the base of the plants at the rate of 10 lb. per acre, two weeks after setting in the field, prevented the disease. Good results have been obtained by applying the borax in solution, using spraying machines with the disks of the nozzles removed. The borax will probably have to be applied annually in light soils and every second or third year in others. In cultural studies 0·54 p.p.m. of boron sufficed for

normal growth, and while twenty times this amount was not injurious, toxicity was evident at 16·2 p.p.m. Applications of 20 lb. per acre produced definite injury in a number of plants.

MUNDKUR (B. B.). **Anthracnose of Cucurbits in the Punjab.**—*Curr. Sci.*, v, 12, pp. 647–648, 1 fig., 1937.

In April, 1937, severe damage was caused on kakri (*Cucumis melo* var. *utilissima*) and kaddu (*Lagenaria vulgaris*) near Ferozepore in the Punjab by a disease very closely resembling cucurbit anthracnose, attributed in the United States to *Colletotrichum lagenarium* [*R.A.M.*, xvi, p. 655] but not hitherto recorded in India. The disease is reported to have been observed in previous years, but usually appeared much later. The spores of the fungus measured 12 to 27 by 4 to 6 μ with a mean of 16·5 by 5·1 μ, and are therefore slightly longer than those of the American fungus.

DE BRUYN (HELENA L. G.). **Heterothallism in Peronospora parasitica.**—*Genetica*, xix, 6, pp. 553–558, 2 figs., 1937.

This is an expanded account of the writer's studies on heterothallism in *Peronospora parasitica*, a preliminary note on which has already appeared [*R.A.M.*, xiv, p. 415]. By the regular transference of the fungus to fresh sterile cabbage seedlings it has been found possible to keep pure monospore cultures growing for some years.

TOMPKINS (C. M.) & TUCKER (C. M.). **Phytophthora rot of Honeydew Melon.**—*J. agric. Res.*, liv, 12, pp. 933–944, 4 figs., 1937.

A brief account is given of a fruit rot which, in 1935, destroyed practically all the honeydew melons (*Cucumis melo* var. *inodorus*) grown in a diseased area, two acres in extent, on heavy, waterlogged soil, in the neighbourhood of Modesto, California. The symptoms of the disease, which affected both immature and ripe fruits, consisted of small brown or water-soaked lesions, enlarging to form large, occasionally zonate lesions, beneath which the invaded fruit tissues became soft, water-soaked, and odourless. Isolations yielded *Phytophthora capsici* [*R.A.M.*, xiv, p. 222], this being the first definite record of this fungus on a cucurbit, although this species may also have been involved in Drechsler's isolation of a *Phytophthora* with prominently papillate sporangia from a honeydew melon [ibid., viii, p. 383], and in Merrill's report of *P. citrophthora* on watermelon, squash, and pumpkins in California [ibid., viii, p. 550]. In addition to the Honeydew melon, the fungus was experimentally shown to be pathogenic to 14 species of fruits in 11 genera belonging to six families, and including avocado pear, peach, apple, and tomato. It is believed that the disease may be controlled by good soil drainage and careful irrigation practice.

P. drechsleri [ibid., xv, p. 550] was experimentally proved to be able to attack the Honeydew melon.

DEMOLON (A.), BURGEVIN (H.), & MARCEL (M.). **Culture du Champignon de couche sur fumier artificiel.** [Cultivation of the edible Mushroom on artificial manure.]—*Ann. Sci. nat., Bot.*, Sér. X, xix, pp. 141–153, 1 fig., 1 graph, 1937.

This is an amplified account of the authors' experiments on the

cultivation of the edible mushroom [*Psalliota* spp.] on artificial manure, a preliminary report of which has already been noticed [*R.A.M.*, xiv, p. 555; xvi, p. 585]. It is stated that while the use of artificially prepared manure is still rather restricted among mushroom-growers, owing to shortage of properly trained labour, a second, 'dilution' method, involving the mixture of one part of horse stable manure with five of moistened wheat or oat straw and the addition of an appropriate quantity of mineral nitrogen salts prior to the fermentation of the whole mass, is apparently rapidly gaining ground.

Geiss (W.). **Die Champignonkultur.** [Mushroom-growing.]—74 pp., 30 figs., Eugen Ulmer, Stuttgart, 1937. [Abs. in *Gartenbauwiss.*, xii, 3, p. 47, 1937.] RM. 2.

This manual treats in popular terms of the cultivation of mushrooms [*Psalliota* spp.] in Germany, and includes discussions on the biology of the mushroom, the preparation and maintenance of the beds, the principal diseases and pests of the crop and their control, and other technical matters.

Zweigelt (F.). **Verfallserscheinungen am Rebstock.** [Degeneration symptoms in the Vinestock.]—*Z. PflKrankh.*, xlvii, 1, pp. 11–18, 1937.

In this note the author gives a cursory survey of the work which is being done at present on the pith disease of the vine [*R.A.M.*, xvi, p. 587] in Austria, Yugoslavia, Czecho-Slovakia, and elsewhere, and states that his own investigations and those of his assistant Voboril, all point to the exceptional importance of the pith in the physiology of the vine. This may be explained by Mohorčič's recent discovery (*Weinland, 1936*, 6) that this pith is strikingly rich in potassium throughout the vegetative period, whereas in other plants, e.g., the elder [*Sambucus nigra*], it is devoid of potassium as early as August. As the vine shoot develops, the pith gradually becomes woody, and it is thought that in the vine the pith serves for the storage of potassium which is used by the plant for wood formation. Any disturbance in the pith due to parasites or other agents leads to serious consequences for the whole vine stock. In the author's opinion the greatest obstacle to a clear understanding of the pathology of the pith disease is the present defective knowledge of the anatomy and physiology of the vine.

Ravaz (L.). **L'Oïdium.** [*Oidium.*]—*Progr. agric. vitic.*, cvii, 19, pp. 438–439, 1 fig., 1937.

The author states that spring renewal of infection of the vine with *Oidium* [*Uncinula necator*: *R.A.M.*, xvi, p. 17] may usually be traced back to the presence in the vineyards of old infected stocks, belonging to a highly susceptible variety, such as Carignan, Terret, or Muscat, on which the parasite overwinters inside the buds and resumes growth at temperatures below those necessary for the opening of the vine buds, 10° or 11° C. Failing removal from the vineyards, such stocks should be kept under careful observation and abundantly sprayed before the start of vegetation with a potassium permanganate solution, to which a wetter may be added immediately before application. This first

treatment should be supplemented later with copious applications of sulphur dust.

ALDEBERT (P.). **Les maladies physiologiques et parasitaires de la Vigne en 1936.** [Physiological and parasitic Vine diseases in 1936.]—*Bull. Soc. Agric. Algérie*, lxxix, 496, pp. 189–191, 1936. [Received April, 1937.]

'Coulure' [failure of flower-setting] of vines [*R.A.M.*, x, p. 640] was very marked in 1936 in the Algiers district. Downy mildew [*Plasmopara viticola*] occurred in epidemic form in Oran, commencing about 15th May, and in certain parts of the Department of Algiers 15 to 18 copper sprayings interspersed with dust treatments were necessary. In the Bône region the use of potassium permanganate was requisite in certain cases for the control of *Oidium* [*Uncinula necator*: see preceding abstract].

BODE (H. R.). **Über die Entwicklungsgeschichte der intracellularen Stäbe im Cambium. Ein Beitrag zum Problem der Reisigkrankheit des Weinstocks.** [On the history of the development of intracellular cordons in the cambium. A contribution to the problem of the 'reisig' disease of the Vine.]—*Gartenbauwiss.*, xi, 3, pp. 272–288, 10 figs., 1 graph, 1937.

This is a detailed account of the author's cytological study of the occurrence and origin of intracellular cordons (which correspond to Sanio's bars in conifers) [*R.A.M.*, xvi, p. 704] in the wood and cambium of 'reisig'-diseased vines. As interpreted by him, the results indicate that the cordons begin to form in the cambium during mitosis, and involve degenerative changes in the substance of the cytoplasmic strands holding the nucleus in position and also in the nuclear spindle itself. The fact that the position of the cordon in the cell very nearly corresponds with that of the spindle axis during mitosis is considered to indicate that the whole nuclear structure, together with the cytoplasmic strands supporting it, is transformed into the cordon by a gradual accumulation in and on it of consecutive layers of cellulose (as indicated by staining reactions), inside which inclusions of an unknown nature are incorporated. No support was found for Petri's view that the cordons originate as 'corpi d'escrezione' [excretion bodies] in the cytoplasm of diseased vines. The author's opinion is further supported by the fact that in the sections of diseased cambium examined by him, numerous degeneration symptoms were seen in the dividing nuclei in cells adjoining those in which the cordons were in the process of formation.

In a discussion of these results, and also with reference to his own and other workers' records of intracellular cordons in the tissues of other dicotyledonous plants, the author states that it is not yet possible to decide whether these cordons are to be considered as specific symptoms of a certain class of pathological disorders or whether they are a sign of a general exhaustion of the organs or tissues involved, possibly due to the deficiency of certain elements, e.g., boron [ibid., xvi, p. 585], in the soil.

McDonald (J.). **Report of the Senior Plant Pathologist.**—*Rep. Dep. Agric. Kenya, 1936*, ii, pp. 1–12, 1937.

Replies to a questionnaire sent out to coffee-growers in Kenya provided further evidence of a close relationship between berry disease [*Glomerella cingulata*: *R.A.M.*, xi, p. 159; xvi, p. 453] and low temperature; opinions as to which flowering (long rains or short rains) produced the most susceptible crop differed according to the different localities.

Thorold confirmed his earlier observation that Elgon die-back [ibid., xvi, p. 87] occurs in different parts of Kenya, typical instances being noted at Sotik and Upper Kiambu. The condition may be considered as a form of 'hot and cold' disease [ibid., xv, p. 436], since the factors responsible for both appear to be similar, but the severest form of 'hot and cold' occurs where the growth is continually stunted owing to the presence of unfavourable factors throughout the year, whereas Elgon die-back appears to develop when such conditions occur only for brief periods, between which growth is normal. It was not possible, however, to reproduce the symptoms of die-back by exposure of the seedlings to low temperatures in the laboratory. Considerable progress has been made in the propagation of resistant types (both by seeds and asexually), and in the affected areas growers now possess nurseries containing resistant-type seedlings grown from these trees.

The results of inoculation experiments with leaf disease (*Hemileia vastatrix* [ibid., xvi, p. 171] showed that wild coffee (*Coffea eugenioides*) can remain practically symptomless even when infection has taken place.

A single pustule that developed on a wheat seedling artificially inoculated with *Puccinia graminis* was ascertained to be caused by a strain of the fungus that is rather more virulent than form K4 [ibid., xvi, p. 87], but does not, probably, constitute an entirely new form. When 35 samples of stem rust from different parts of Kenya were tested, all four forms were found to occur in one area or another, forms K2 [ibid., xvi, p. 89] and K4 again being the most prevalent. Form K4 was also found on a single sample of Kenya Standard wheat from Tanganyika. Wheat grown experimentally at an altitude of 11,000 ft. on Elgon was slightly affected by leaf rust [*P. triticina*] and yellow rust [*P. glumarum*].

Liral Crown flax at Nakuru and Kitale was affected by rust (*Melampsora lini*), a new record for Kenya; the damage to the fibre was occasionally somewhat serious, but there appeared to be little reduction in yield of seed.

Other new records included *Melanconium* [*Pleocyta*] *sacchari* [ibid., xvi, p. 774] on sugar-cane, splitting of peach believed to be due to *Armillaria mellea*, *Erysiphe polygoni*, *Peronospora viciae* [ibid., xiv, p. 340 *et passim*], and *Ascochyta pisi* on field peas, *E. polygoni* on cowpea, *Beniowskia sphaeroidea* [ibid., vii, p. 13: as *B. penniseti*] on *Pennisetum purpureum*, *Ustilago crameri* on *Setaria italica* [ibid., xvi, p. 247], and a virus-caused woodiness of granadilla (*Passiflora edulis*) [cf. ibid., xv, p. 593].

Waterston (J. M.). **Report of the Plant Pathologist, 1936. 1st October to 31st December.**—*Rep. Bd Agric. Bermuda, 1936*, pp. 22–27, 1937.

This report [*R.A.M.*, xv, p. 559] contains the following items of

phytopathological interest, apart from those already noticed from other sources. During the period under review yellow flat [or rosette] of lilies [loc. cit. and ibid., xvi, p. 752] became less prevalent, and there was little stump rot (*Phytophthora parasitica*) [loc. cit.], but there was a marked increase in the incidence of 'twist' [ibid., xiv, p. 559], a condition characterized by distortion and yellowing of the upper leaves and apparently aggravated by dry conditions. New York and Big Boston lettuces were affected by *Sclerotinia sclerotiorum* [ibid., xv, p. 477], the Iceberg variety being less susceptible, and a few lettuce plants were attacked by aster [*Callistephus chinensis*] yellows [ibid., xvi, p. 678]. *Fusarium oxysporum* was present on Bliss Triumph potato [ibid., xvi, p. 488] seed imported from Long Island, losses in the field in one instance amounting to 2½ barrels out of 8. In one locality Bonnie Best tomatoes (a very susceptible variety) were severely attacked by *Fusarium* [*bulbigenum* var.] *lycopersici* [ibid., xvi, p. 781], the outbreak having been favoured by continuous cropping to tomatoes without rotation. Damping-off (*Corticium solani*) of *Calendula* was prevalent in October but was checked by the use of formalin or Cheshunt mixture.

EASTHAM (J. W.). **Report of Provincial Plant Pathologist.**—*Rep. B. C. Dep. Agric., 1936*, pp. P39–P45, 1937.

Diagnosis of the chlorotic disease of cherries recently reported from British Columbia as of virus origin [*R.A.M.*, xv, p. 480] is stated to be difficult during summer owing to the presence of powdery mildew [*Podosphaera oxyacanthae*] which may cause similar symptoms. In addition another trouble, also apparently due to a virus, is present, which causes little chlorosis but severe deformation of the leaves, which become deeply indented and in some cases are reduced to a mere ribbon.

In seed treatments of wheat against bunt [*Tilletia caries* and *T. foetens*], ceresan ½ and 4 oz. per bushel and methyl mercury oleate 4 gm. per bush. gave, respectively, 73·5, 72, and 74·2 per cent. seedling emergence, as compared with 59·7 per cent. in the untreated control, and reduced soil-borne infection from 37·4 per cent. in the controls to 26·5, 13·7, and 24·2 per cent. respectively.

In a comparative spraying test made with different chemicals against antirrhinum rust (*Puccinia antirrhini*) [ibid., xvi, p. 752] the best results were given by Bordeaux mixture and penetrol [ibid., xvi, p. 659], Bordeaux mixture and lethalate [ibid., xv, p. 653], and Bordeaux mixture alone (two applications of each with 10-day interval) with 0·7, 0·8, and 13·4 per cent. infection, respectively, as against 62·5 per cent. in the untreated control.

In varietal tests for resistance to scab (*Venturia pirina*) at Saanichton, Boussock, Dr. Jules Guyot, and Bartlett pears showed, respectively, 3·4, 3·8, and 6·9 per cent. infection against 66·5 per cent. for Anjou. Bouisol gave the best control of the disease (12·6 per cent. scab against 43·6 per cent. for lime-sulphur). Bouisol (4·5 pts. per 100 galls.) was slightly less effective than Bordeaux mixture against apple anthracnose (*Neofabraea malicorticis*) [ibid., xv, p. 481].

New records included *Septoria chrysanthemi* [ibid., xii, p. 677] causing a severe leaf blight on new strains of Shasta daisy (*Chrysanthemum maximum*), *Cytospora chrysosperma* [loc. cit.] on 6- to 8-year old

Lombardy poplars [*Populus nigra* var. *italica*], and *Pseudomonas* [*Bacterium*] *delphinii* [ibid., xv, p. 229] on *Delphinium* in Vancouver.

Van Heusden (W. C.). **Beknopt overzicht van de ondernemingscultures in het rayon Zuid-Sumatra gedurende 1936.** [An abridged survey of the plantation cultures in the region of south Sumatra in 1936.]—*Bergcultures*, xi, 20, pp. 713–719, 1937.

Rubber [*Hevea brasiliensis*] sustained heavy damage in south Sumatra in 1936 from the attacks of root fungi, including *Rigidoporus microporus* [*Fomes lignosus*: *R.A.M.*, xii, p. 720; xvi, p. 160], which also attacked *Derris elliptica*; *F. noxius* [ibid., xvi, p. 60]; *Ganoderma pseudoferreum*; and *Ustulina zonata* [ibid., xvi, p. 634]. Excessive thinness of the cortex, entailing marked liability to mechanical wounding, e.g., by tapping implements, is believed to be the primary cause of a complex disturbance known as 'bark and foot rot' associated with a species of *Phytophthora* and mainly affecting young bud grafts [ibid., xiii, p. 470]. In addition to precautions against injury in tapping operations, care in the application of protective substances to the bark is indicated. *P. faberi* [*P. palmivora*: ibid., xvi, p. 772] was prevalent, and *Oidium heveae* [loc. cit.] was widespread during August, especially in the Lampongs, where the regular use of sulphur gave good control in three plantations. *Marasmius equicrinis* [ibid., viii, p. 17] was reported from an estate in Lower Palembang.

Isolated attacks of *F. noxius* on coffee occurred both in the Lampongs and Palembang. *Rosellinia bunodes* [ibid., ix, p. 778 *et passim*] assumed a severe form, especially in Benkoelen, and *Xylaria thwaitesii* [ibid., xiv, p. 743] was observed sporadically. Top die-back (*Rhizoctonia* sp.) [ibid., xvi, p. 670] became increasingly prevalent in Benkoelen and Upper Palembang, particularly following heavy rains. *Corticium salmonicolor* [ibid., xvi, p. 634] and *C. gardeniae* [ibid., xvi, p. 453] were observed locally in the presence of intense humidity and dense shade.

Rosellinia bunodes was the chief agent of damage on tea roots [ibid., xv, p. 686], which were also attacked, especially at high elevations (about 1,400 m.), by *F. noxius* [ibid., xvi, p. 635]. Scattered instances of grey blight (*Pestalozzia theae*) and brown blight (*Colletotrichum camelliae*) [*Glomerella cingulata*: ibid., xvi, p. 128] were reported, while *P. leucodisca* was apparently the agent of a disease characterized by canker-like excrescences. *Cercosporella theae* [ibid., xiii, p. 216] was responsible for heavy damage on a Benkoelen estate, where 'bitten-off' disease of seedlings, attributed to an unfavourable soil reaction [ibid., xi, p. 749], was also in evidence.

Levine (M.) & Chargaff (E.). **The response of plants to chemical fractions of Bacterium tumefaciens.**—*Amer. J. Bot.*, xxiv, 7, pp. 461–472, 3 pl., 1937.

A fully illustrated account is given of the results of experiments, in which the authors studied the effect on the injured tissues of 25 species of plants, grown chiefly in the garden, of the chemical fractions of *Bacterium tumefaciens* [*R.A.M.*, xv, p. 706], as compared with that of the heteroauxins, indoleacetic, and indolepropionic acids [ibid., xvi, p. 730]. When applied to plants normally producing adventitious roots,

the heteroauxins induced a concentration of root development over the treated areas, but no discrete overgrowths were formed; small growths, bearing a close histological resemblance to crown gall tissue, were, however, occasionally produced on tomato, *Cosmos*, and kidney bean (*Phaseolus vulgaris*) plants treated with these substances, in addition to adventitious roots. Of the three chemical fractions of *Bact. tumefaciens*, the phosphatide fraction seemed to produce greater reaction than the others in the form of cell proliferations in the stems of the treated plants. In sunflower [*Helianthus annuus*] stems, the phosphatide fraction caused hyperplasia, while the fat fraction seemed to induce hypertrophy, and the polysaccharide fraction induced necrosis with limited cellular proliferation, which may be a secondary, reparative process. These results would indicate that sizeable overgrowths in plants can only be induced by the living bacteria, and, further, that some species of plants, like some species of animals, do not react to chemical stimulation by tumour production. In the light of our present knowledge, the histological structures induced in plants by chemical means cannot be directly related to animal cancer.

McFadden (E. S.). **False 'black chaff' of Wheat produced by inoculating with stem rust.**—*Phytopathology*, xxvii, 7, p. 801, 1937.

Varieties or hybrid strains of wheat with a specific type of mature plant resistance to *Puccinia graminis tritici* [*R.A.M.*, xv, p. 561], e.g., Hope and H–44, are liable to react to infection by the rust by the development of dark-coloured lesions simulating those of 'black chaff' (*Bacterium translucens* var. *undulosum*) [ibid., xvi, p. 243]. Microscopic observations indicate that the discoloration may result from the disintegration of the invading organism within the living cells of the host. Hypodermic inoculations of F_2 plants of an H–44 × Marquis cross with *P.g. tritici* showed all plants giving the 'black chaff' reaction to be resistant to the rust at maturity, though all had contracted infection. The 'black chaff' reaction can thus be used in certain wheat crosses as an 'ear mark' of mature plant resistance to black rust, thereby facilitating breeding for rust resistance, especially by the back-cross method.

Crépin (C.). **Le Blé Côte d'Or.** [The Côte d'Or Wheat.]—*Agric. prat., Paris*, N.S., ci, 29, pp. 1035–1037, 2 figs., 1937.

In connexion with a brief statement on the characters of the new hybrid wheat, Côte d'Or, resulting from a cross between Vilmorin Paix 15–5 and a red-eared Burgundian strain, the writer mentions its virtual immunity from yellow rust [*Puccinia glumarum*] and its resistance to black rust [*P. graminis*].

Tillet (M.). **Dissertation on the cause of the corruption and smutting of the kernels of Wheat in the head, and on the means of preventing these untoward circumstances.**—Translated from the French by H. B. Humphrey.—*Phytopath. Class.* 5, 191 pp., 1937. Price $ 1.25.

This is a very readable and well-presented translation of Mathieu du Tillet's classical dissertation [cf. *R.A.M.*, xvi., p. 731] first published in 1755 on the causes of the corruption of wheat grains in the ear, in

which he experimentally showed that bunt [*Tilletia caries* and *T. foetens*] resulted from contamination of the seed with the bunt dust. The author also drew a clear distinction between smut [*Ustilago tritici*] and bunt of the crop, and gave a separate description of ergot of rye [*Claviceps purpurea*] showing that this disease also attacked other Gramineae. The original title page of the work is reproduced in facsimile.

WINTER (G.). **Zur Frage der Bedeutung biologischer und edaphischer Faktoren für das Auftreten der Ophiobolose des Weizens.** [On the question of the influence of biologic and edaphic factors on the development of ophiobolosis of Wheat.]—*Z. PflKrankh.*, xlvii, 7, pp. 369–380, 1937.

This is a summary of recent investigations on the influence of biological and edaphic factors on the development of *Ophiobolus graminis* on wheat [*R.A.M.*, xvi, p. 735]. Most of the papers referred to in the course of the survey have been noticed from time to time in this *Review*.

GARRETT (S. D.). **Brom-thymol blue in aqueous sodium hydroxide as a clearing and staining agent for fungus-infected roots.**—*Ann. Bot., Lond.*, N.S., i, 3, p. 563, 1937.

The following method of clearing, staining, and mounting fungus-infected roots of seedlings for microscopic examination is described. The roots are soaked in a solution of 0·04 per cent. brom-thymol blue in 4 per cent. aqueous sodium hydroxide for a period of not less than five minutes and then mounted in the same reagent, which clears and macerates the root tissues, allowing the root to be pressed out flat under the cover slip. Young hyphae, spores, sporangia, and the meristematic tissue of the root apices are stained blue by this method, preparations made according to which are not permanent.

GALLETTI (A. C.). **Sull' ingiallimento delle piantine di Frumento sotto i filari delle Vite. Indagini, considerazioni. (Nota preventiva).** [On the yellowing of Wheat seedlings under Vine rows. Investigations, considerations. (Preliminary note).]—*Riv. Pat. veg.*, xxvii, 5–6, pp. 149–160, 1937.

Wheat grown between vine rows near Modena is affected each winter by a characteristic yellowing and a retardation of growth. Every spring the plants attain the normal colour but remain weak and give poor yields. Plants grown in other soil brought to the same rows remained normal, while others grown in the same soil put down elsewhere developed characteristic symptoms of the condition. No causal organism was associated with the trouble, which the author attributes to the high copper content of the soil (0·417 gm. per kg. at ordinary levels, and 0·019 gm. per kg. at a depth of 40 to 50 cm.).

Owing to spraying with Bordeaux mixture all soils planted to vines contain copper, which, however, is present in an insoluble form, is confined to the superficial layers only, and has been shown to exercise no deleterious effect on plant life [*R.A.M.*, xiv, p. 76]. When the author grew wheat seedlings in clay and in sand to which was added copper sulphate solution in amounts equivalent to the quantity of

copper found in the soil in question, the effect of the clay in eliminating the toxicity of the copper was very striking. Under field conditions, the carbonates and colloids present in the soil are thought normally to immobilize the cation and render the copper entirely unassimilable.

Experiments in different localities showed that the prompt application of physiologically acid salts (especially iron sulphate) and nitrates induced a rapid return of the normal green colour of the affected wheat in the spring. The available evidence indicates that in the soil in question (which is alkaline) the copper brings about a true iron deficiency, the iron being rendered unavailable to the wheat. Nitrates being very soluble pass through the soil and reach the roots at levels where the effects of the copper are not felt, with the result that the roots are stimulated to function normally. For control, the author recommends applications of sulphur to the soil since the resulting sulphuric acid renders the iron present soluble during vegetation. The continuous application of iron sulphate should be avoided, but nitrates may be applied just before the spring to accelerate root activity.

Sprague (R.). **A further note on the fungus causing a white foot rot of Wheat and Oats.**—*Phytopathology*, xxvii, 7, pp. 798–800, 1937.

A comparative study of cultures of *Gibellina cerealis* isolated from wheat at the Rothamsted Experiment Station [*R.A.M.*, xv, p. 433], and the fungus responsible for white foot rot of wheat and oats in Oregon [ibid., xiv, p. 26] has afforded definite proof that the two organisms are distinct. The former produces a mounded, slow growing, pale grey colony with numerous perithecia, while the latter is characterized on potato dextrose agar by a dirty white, loose mycelial growth in which sclerotia (but no fruiting stage) develop resembling those of *Rhizoctonia* [*Corticium*] *solani*. The Oregon fungus was tentatively identified as *G. cerealis* on the basis of named cultures of the fungus received from Italy and is now considered probably to belong to *Rhizoctonia*.

Johnston (C. O.), Fellows (H.), & Melchers (L. E.). **Reaction of certain varieties of Wheat to infections of powdery mildew at Manhattan, Kansas, 1932–35.**—*Plant Dis. Reptr*, xxi, 11, pp. 201–211, 1937. [Mimeographed.]

As a result of observations made in rust [*Puccinia* spp.] and foot rot [*Ophiobolus graminis* and other fungi] nurseries at Manhattan, Kansas, from 1932 to 1935, inclusive, tabulated data are presented on the reaction of a large number of wheat varieties to naturally occurring powdery mildew (*Erysiphe graminis*) [*R.A.M.*, xvi, pp. 49, 519]. The disease is a minor one locally, found as a rule only in wet seasons or in lodged spots in low-lying fields, but in the nurseries in question it was frequently very severe and abundant, as early sowing resulted in autumn infections and the delay in harvesting necessitated by experimental conditions favoured perithecial development. The following varieties showed resistance: Iowin and Smithsonian (hard red winter); Michigan Amber selection 29–1–1–1 and Nittany (soft red winter); Bomen, Dixon selection, Hope, Lambrigg, Norka, Progress, and Supreme (all outstanding for resistance among the hard red spring

varieties); Sapporo spring No. 1 and several selections of Illinois No. 1 (soft red spring) and Barwang, Carrabin, Currawa, and Malan's (white spring). All the emmer (*Triticum dicoccum*) and einkorn (*T. monococcum*) selections were strongly resistant and *T. timopheevi* was not infected.

PETIT (A.). **Observations sur le traitement des grains de Blé contre le charbon interne (Ustilago tritici).** [Observations on the treatment of Wheat seed against loose smut (*Ustilago tritici*).]—*Rev. Path. vég.*, xxiv, 2, pp. 175–185, 1937.

Tests carried out in Tunis in 1936 on the control of loose smut of wheat (*Ustilago tritici*) by hot-water treatment [*R.A.M.*, xvi, p. 661] showed that (with the Florence × Aurora hybrid) infection was reduced to at least eight times less than in untreated material as a result of 40 (or better still 50) minutes' immersion at 45° C., followed by 10 minutes at 52°, the efficacy of the treatment depending on the sanitary condition of the seed. The method of using one long immersion (nearly 2 hours at 45°) gives complete control of the disease but injures the germination, while the short immersion method permits of treating large quantities of seed without loss of time, and reduces the difficulty of drying, as it increases the moisture content of the seed by only 27 to 30 per cent., as against an increase of nearly 40 per cent. for the single long treatment. The long treatment has the advantage of allowing small quantities of smut-free seed to be prepared which, after two or three years' cultivation, will give a clean crop. To secure normal germination of seed treated by the short method the humidity must gradually be reduced to normal (12 to 13 per cent.), the environmental conditions in which germination occurs must be at an optimum, and the dried seed must be dusted with copper carbonate to preserve it against the attacks of soil fungi.

EKSTRAND (H.). **Trådklubba på vintersäd. Sklerotiesjuka pa fodergräs.** [*Typhula* on winter cereals. Sclerotial disease on fodder grasses.]—*Växtskyddsnotiser Växtskyddsanst., Stockh., 1937*, 1, pp. 3–5, 3 figs., 1937.

The species of *Typhula* (formerly referred to *T. graminum*) commonly observed on winter cereals in southern and central Sweden is stated to agree with *T. itoana* [*R.A.M.*, xv, p. 348], whereas an entirely different form was isolated in May, 1936, from rye in a northern locality. It is characterized by circular, brownish-black sclerotia, ½ to 1 mm. in diameter, and occurs also on timothy [*Phleum pratense*], *Stellaria media*, *Arabis arenosa*, *Thlaspi arvense*, and certain grasses, while a sample of wheat attacked by the same fungus, which is named *T. borealis*, was received from another district of the same northern province.

At the same time and in the same region a species of *Sclerotinia* (? *S. borealis* Bub. & Vleugel), with sclerotia 3 to 6 by 1½ to 2 mm., was found on rye grass [*Lolium perenne*] and other fodder grasses.

VOLK (A.). **Untersuchungen über Typhula graminum Karst.** [Investigations on *Typhula graminum* Karst.]—*Z. PflKrankh.*, xlvii, 6, pp. 339–365, 14 figs., 1937.

In Germany *Typhula graminum* [see preceding abstract] seldom

occurs in a destructive form on barley (its chief cereal host), on which the damage is usually confined to a few plants in a stand. The roots are partially or wholly destroyed and the outer leaves and sheaths permeated by the mycelium, which further kills the secondary haulms or impedes their emergence by agglutination of the leaf primordia. Both roots and shoots are covered with sclerotia, ordinarily of very variable form and size, though one strain of the fungus from East Prussia is consistently characterized by a uniformly spherical shape, a diameter of 1 to 1½ mm., and a light brown coloration. The yield reduction due to the paucity of haulms and poor seed production averages 6 per cent. Slight infection by *T. graminum* frequently paves the way for subsequent invasion by *Ophiobolus graminis*.

The minimum, optimum, and maximum temperatures for the development of *T. graminum* were found to be above 0°, 8°, and 25° C., respectively. Free hyphal formation (leading to a rapid flat extension of the fungus) was shown to be promoted by darkness, a high degree of humidity, and a temperature range of 3° to 8°. The septate, hyaline hyphae form anastomoses and clamp-connexions in profusion, while thick-walled mycelial strands are not uncommon in older cultures. The typical sclerotia of the fungus develop best on a medium of 2 per cent. agar, 3 per cent. biomalt, and 2 per cent. calcium carbonate; they may arise either through the dense intermingling of numerous branching hyphae (this being evidently the common method in nature) or by the swelling of the hyphae. A neutral reaction proved to be the most favourable for sclerotial growth (minimum P_H 3·5). The sclerotia from pure cultures remained viable for 16 months, while outdoor material was still capable of growth after 25. The fungus does not tolerate the drastic withdrawal of oxygen.

Attempts to induce fructification in *T. graminum* gave somewhat inconclusive results. Only in nine-months-old agar cultures exposed to full daylight were mycelial strands formed corresponding to those described by [Ruth] Remsberg and [C. W.] Hungerford [*R.A.M.*, xiii, p. 222]; of these the branched were consistently sterile while only a few of the unbranched gave indications of rudimentary hymenial formation, with sterigmata and possibly spores, though the last-named were not detected. Sufficient evidence is, however, available to classify the fungus as a *Typhula* and not a *Sclerotinia*.

Inoculation experiments in 1930 and 1933 showed that the heaviest infection occurs on early winter barleys (Janetzki's Early and Kalkreuth Universal), other susceptible varieties being Friedrichswert Berg, Eckendorf Mammoth II, Mahndorf Victoria, Manshold Groningen, and Peragis; of the three summer barleys tested, only Ackermann's Bavaria was slightly attacked. Winter wheats and rye sustained little damage, summer wheat and oats none. Of the grasses used in the experiments the most susceptible were *Hordeum murinum*, *Poa annua*, and *P. trivialis*, but mild infection also occurred on a number of others, including *Phleum pratense* and *Lolium perenne*. The sclerotia are the chief sources of natural infection.

Control measures should be directed towards counteracting the environmental conditions favouring the pathogen. Thus dryness of the upper soil layers should be induced by hoeing or harrowing in the

autumn and spring. Late sowing (October or early November at Königsberg, East Prussia) combined with sparse planting and shallow planting contribute to the suppression of free mycelial development, while the application of readily assimilable nitrogenous manures in the spring stimulates adventitious root development and so reduces the extent of the injury caused by the pathogen.

THREN (R.). **Gewinnung und Kultur von monokaryotischem und dikaryotischem Myzel. Ein Beitrag zur Physiologie und Genetik des Gerstenflugbrandes (Ustilago nuda (Jens.) Kellerm. et Sw.).** [Isolation and growth in culture of uninuclear and binuclear mycelium. A contribution to the physiology and genetics of Barley loose smut (*Ustilago nuda* (Jens.) Kellerm. & Sw.).]—*Z. Bot.*, xxxi, 7–8, pp. 337–391, 1 pl., 10 figs., 1937.

The author gives a detailed account of his studies in pure culture of the progenies of 20 collections of *Ustilago nuda* from as many localities in Germany and elsewhere, widely differing in climatic and other conditions. On exposure to temperatures between 1° and 2° C. the promycelial cells did not fuse together, but became deeply constricted at the cross walls, in extreme cases leading to the complete separation of the four haploid cells [cf. *R.A.M.*, xvi, p. 240]. When germinated separately the four cells produced haplonts which always segregated in their type of growth in the ratio 2 : 2, each type being of a different sex. When paired together lines of different sexes showed hyphal fusions, the behaviour of the sexes indicating anisogamous somatogamy. Both sexes grew approximately equally well on malt extract agar, but the minus strain alone was able to develop on potato agar and on malt extract gelatine, the failure of the plus strain to develop being presumably attributable to the lack in the medium of some substances necessary for its growth. The dicaryonts produced by paired lines of different sexes for the most part showed great stability when cultured on artificial media, and differed considerably in their type of growth from that of the haplonts. The dicaryonts could also be obtained and propagated farther in pure culture by various combinations of haploid mycelia. The type of growth obtained either from single spores or from massed spore collections agrees entirely with that of the dicaryonts obtained by pairing the promycelial cells. Segregations which occasionally occur in uninuclear mycelia are always shown by a change in the type of growth.

HONECKER (L.). **Die Bestimmung der physiologischen Rassen des Gerstenmehltaues (Erysiphe graminis hordei Marchal).** [The determination of the physiologic races of Barley mildew (*Erysiphe graminis hordei* Marchal).]—*Phytopath. Z.*, x, 2, pp. 197–222, 6 figs., 1937.

Continuing his studies on barley mildew (*Erysiphe graminis hordei*) [*R.A.M.*, xv, p. 568], the writer found that the standard assortment used by Mains and Dietz for the determination of physiologic specialization in the fungus in the United States [ibid., ix, p. 643] did not give satisfactory results in Germany, and it was further necessary, in view of the multiplicity of colour and structural changes induced in the

foliage by the disease, to amplify the criteria for the various reaction types established by these authors. The assortment now used by the writer consists of eight varieties, viz., Hohenfinow, Weihenstephan C.P. 127/422, *Hordeum spontaneum nigrum*, Gopal C.J. 1091, Ragusa D.R. 34–40, Sweden 860, Samaria, and Peruvian C.J. 939/d. On the basis of their pathogenicity to these varieties nine physiologic races of *E.g. hordei* have been separated from the 101 collections examined between 1933 and 1936, of which five were described in previous papers while the remaining four (F, G, H, and J) are newly reported. Race G is grouped with B, E, and C, H and J with A and D, but F stands alone. All the new races were encountered once only, F being apparently a spontaneous mutant capable of attacking the otherwise highly-resistant *H. spontaneum nigrum*, while each of the others originated in scientific institutions or breeding establishments with a large number of varieties under cultivation. Race A continues to predominate and to be the cause of the prevailing mildew epidemics.

Shands (R. G.). **Longevity of Gibberella saubinetii and other fungi in Barley kernels and its relation to the emetic effect.**—*Phytopathology*, xxvii, 7, pp. 749–762, 1 graph, 1937.

A fully tabulated account is given of the writer's studies in Wisconsin on the longevity of *Gibberella saubinetii* and other fungi in barley kernels in relation to the emetic effect of such food on pigs [*R.A.M.*, xvi, p. 525]. *G. saubinetii* was found to retain its nauseating action 56 months after the barley was harvested, at which time, according to plating tests, the fungus had been non-viable for at least 26 months. The duration of viability varied considerably among the different fungi used in the tests and also in the same organism from different sources. *G. saubinetii*, for instance, was viable in inoculated material 27 months after harvesting, whereas the same fungus from naturally infected barley from Iowa did not appear on the plates 20 months after harvest. Neither *Fusarium culmorum* nor *F. avenaceum* developed from inoculated kernels 28 months after harvest. An unidentified *F.* sp. and an *Alternaria* remained viable for 57 months under experimental conditions, while the latter was further isolated 75 months after harvesting from an Iowa sample. *Helminthosporium gramineum* was viable after 75 and 123 months, respectively, in Iowa and Wisconsin material, while other *H.* spp. appeared in the plates after 51 months. Storage conditions evidently affect fungal longevity to some extent. For example, *Alternaria*, *Helminthosporium*, and *Penicillium* spp. lost their viability sooner in the seed-house than in the laboratory, whereas the reverse was the case with *G. saubinetii*.

De Haan (J. T.). **Untersuchungen über das Auftreten der Keimlings-Fusariose bei Gerste, Hafer, Mais und Reis.** [Studies on the occurrence of seedling fusariosis in Barley, Oats, Maize, and Rice.]—*Phytopath. Z.*, x, 3, pp. 235–305, 28 graphs, 1937.

A comprehensive, fully tabulated account is given of the writer's investigations at the Federal Technical College, Zürich, on the influence of temperature on the seedling blight of barley, oats, maize, and rice caused by *Fusarium herbarum* [*F. avenaceum*] (Doyer's strain),

F. culmorum (Wickens's strain), and *F. moniliforme* [*Gibberella moniliformis*] (Bolle's strain). The work fell into three parts and involved studies on the effect of temperature on (*a*) the growth of the fungi, (*b*) the development of the hosts, and (*c*) the degree of infection [*R.A.M.*, xii, p. 564; xv, p. 788, *et passim*].

In a modified Richards's solution *F. avenaceum* withstood the lowest temperature, mycelial growth being perceptible even at 3° C., while the corresponding minima for *F. culmorum* and *G. moniliformis* were 9° and 6°, respectively. The optimum temperatures for *F. culmorum* and *G. moniliformis* were 27° and 27° to 30°, respectively; *F. avenaceum* reacted less sharply and grew equally well throughout the range from 18° to 27°. The maximum for *F. avenaceum* was 33° and for the other two species 36°. On a solid (malt agar) medium the temperature relationships of the three pathogens were similar to the foregoing.

The optimum temperature for the germination of Klettgau barley was between 12° and 18°, for Argovia barley 9° to 15°, for Brune de Mont Calme oats 15·2°, for Goldkorn oats 3° to 9°, for Golden Bantam maize 21°, for Rhine Valley maize 15·5° to 27·5°, for Si Landjah rice 30°, and for Pasir Nangka rice 33° to 36°. The optimum soil temperatures for barley, oats, maize [ibid., ii, p. 537], and rice growth were found to be 21°, 24° to 28°, 30°, and 31° to 36°, respectively.

Stunting of barley by *F. culmorum* occurs chiefly at the higher temperature ranges which conduce to the prevalence and virulence of this species; seedling development is also apt to be more or less adversely affected. *G. moniliformis*, on the other hand, tends to increase the longitudinal growth both of barley and rice, especially Si Landjah [ibid., xi, p. 332]. *F. avenaceum* and *F. culmorum* both stimulated the development of oats, the former at soil temperatures up to 23° and the latter between 7° and 26°, while Brune de Mont Calme responded similarly to infection by *G. moniliformis*. Stunting of maize followed severe infection by *F. avenaceum*, and *F. culmorum* produced similar effects, even in the absence of noticeable pathogenic symptoms. *G. moniliformis*, on the other hand, conduced to vigorous growth in Rhine Valley maize throughout practically the entire temperature range of the experiments. The development of rice was not influenced by *F. culmorum* or *F. avenaceum* under the conditions of the tests.

Leukel (R. W.). **Seed treatment experiments with Oats naturally and artificially inoculated with smuts.**—*Tech. Bull. U.S. Dep. Agric.* 568, 16 pp., 1937.

A tabulated account is given of experiments from 1932 to 1936, inclusive, to test the efficacy of 16 fungicides in the disinfection of the seed of 11 oat varieties against covered (*U. levis*) [*U. kolleri*] and loose [*U. avenae*] smuts [*R.A.M.*, xv, p. 347]. The most satisfactory results, both from the standpoint of smut control and the effect on germination and stand, was obtained, with one exception, with new improved ceresan. Liquid formalin (1 in 320 for 5 mins.) and formalin spray (1 qt. half strength formalin to 50 bush.) were also effective but frequently injurious to the seed. Good control was also afforded by the formalin dusts tested, especially when they were applied two days or more before sowing, and their occasional failure to give satisfaction is

attributed to the loss of volatile matter on standing. Formacide (a paraformaldehyde dust containing a catalytic agent which, in the presence of moisture, causes paraformaldehyde to revert to gaseous formaldehyde) gave promise of being a good disinfectant for oats; the treatment costs about 3·4 cents per bush. of seed, which is somewhat higher than that for new improved ceresan. Prolonged storage of oats treated with the above-named dusts is not recommended, unless the grain moisture content is about 14 per cent. or less, is thoroughly aerated a few days after treatment, and the storage room is cool and dry.

An outstanding feature of the investigations was the relatively high percentage of smut in the plants raised from seed inoculated by the evacuation method, as compared with inoculation without vacuum or with dry spores, and also the occasional failure of even the better disinfectants to give satisfactory control with such seed. Examination of treated grains showed that in the evacuation method the caryopsis and the inner side of the glumes were literally darkened with the smut spores, which were particularly abundant about the embryo end, while no spores were found beneath the glumes of the seeds inoculated with dry spores, although in this case the spores were much more abundant on the outside of the glumes. The fact that the percentage of smutted heads was not materially increased by artificial inoculation in Norton oats suggests that the smut which developed in the crop must have been caused by natural infection at blossoming time [ibid., vii, p. 503].

Bowman (D. H.), Martin (J. H.), Melchers (L. E.), & Parker (J. H.). **Inheritance of resistance to Pythium root rot in Sorghum.**—*J. agric. Res.*, lv, 2, pp. 105–115, 4 figs., 1937.

A tabulated account is given of greenhouse experiments at Manhattan, Kansas, and Arlington, Virginia, and field tests at the Garden City Sub-station of the Kansas Agricultural Experiment Station, in which the reaction to the root rot caused by *Pythium arrhenomanes* [*R.A.M.*, xvi, p. 740] was studied in the progenies of twelve crosses between sorghum varieties resistant or susceptible to infection. The results indicated that reaction to the disease is determined by a single major factor difference, and that susceptibility is partly dominant and is inherited independently of coleoptile (seedling) colour and of hybrid vigour (heterosis) of the progenies.

Tomkins (R. G.) & Dreyer (D. J.). **A note of low temperature breakdown of Grapefruit from Somerset West.**—*Fmg S. Afr.*, xii, 133, pp. 157–159, 3 figs., 1937.

An investigation was carried out in 1935 on a number of cases of specially picked Somerset West grapefruit to determine a possible correlation between certain orchard factors and the low temperature pitting [*R.A.M.*, xiv, p. 754; cf. ibid., xvi, p. 742] observed on the arrival of similar fruit in England in the previous year. Fruit from the outside of the trees was found to be more susceptible to this type of injury than that from the inside (33 as compared with 2 per cent. pitting). The other factors considered (including methods of packing and storage duration) were without appreciable effect on the condition of the fruit.

Botero (R. O.). **Apartes del informed sobre reconocimiento fitopatologico del Quindio (Caldas).** [Extract from the report on the phytopathological survey of Quindio (Caldas).]—*Rev. cafetera Colombia*, vi, 97–99, pp. 2186–2188, 6 figs., 1937.

The author records the occurrence in the Quindio district of Colombia of *Rosellinia pepo* [*R.A.M.*, xiv, p. 84; xv, p. 213] on a species of *Erythrina* used as a shade tree for coffee, and also on *Inga* sp. This is stated to be the first record of the fungus from Colombia.

Botero (R. O.). **Preliminaries al estudio del 'mal de tinta' en el Cafe.** [Preliminary note on the study of the 'ink disease' of Coffee.]—*Rev. cafetera Colombia*, vi, 93–96, pp. 2131–2132, 1937.

In giving a brief account of the symptoms of a disease of coffee, locally known under the Spanish equivalent of ink disease, the author states that it is prevalent over the whole of Colombia, but frequently causes very important losses from Santander southwards. While the trouble has not yet been definitely diagnosed, he inclines to the view that it is caused by *Phytomonas leptovasorum* [*R.A.M.*, xiv, p. 218; xv, p. 292]. A thorough study of the disease under Colombian conditions is urgently advocated.

McDonald (J.). **Coffee in Kenya.**—vi + 210 pp., 28 pl., 6 graphs, 2 maps, Nairobi, Govt Printer, 1937. Price 5*s*.

In Part V (pp. 148–190) of this book, compiled jointly by the officers of the agricultural services in Kenya, and edited by J. McDonald, the latter gives a semi-popular account of the parasitic and non-parasitic diseases which attack the crop in that Colony.

Suchorukoff [Sukhorukoff] (K.) & Strogonoff (B.). **The activators of peroxidase in sick plants.**—*C. R. Acad. Sci. U.R.S.S.*, N.S., xv, 9, pp. 563–565, 1937.

Most diseases due to facultative parasites are stated to cause an increase of oxidation reaction at the points of infection and in studying this reaction in relation to *Verticillium albo-atrum* on cotton the authors state that peroxidase activity (estimated in c.c. of N/10 potassium permanganate per gm. of raw material, by the pyrogallol method) was 11·4 and 10·0 in the roots and petioles, respectively, of infected plants, as against 5·0 and 5·1 in those of healthy plants. Further tests by the same method indicated that the activity of peroxidase in the mycelium of *V. albo-atrum* and *V. dahliae* grown on a saccharo-mineral medium is comparatively low, and that the diffusion of the ferment into the substratum is negligible, so that the increase in the activity of the peroxidase in the diseased organs is due to the action of the fungus on the oxidizing system of the cell. Experiments with a peroxidase of known high activity, prepared from an aqueous extract of horse-radish (1 in 10) showed that, besides the small amounts of peroxidase, *V. albo-atrum* discharges into the nutrient medium a large amount of an activator of the horse-radish peroxidase, the accumulation of which was greatest in the medium of old cultures (58 days). There was also evidence of the presence of certain fermentation inhibitors in the mycelium. Biochemical tests showed a high activity of the peroxidase in

the parenchyma cells adjoining vessels invaded by *V. albo-atrum*, resulting in their necrosis and destroying the resistance of the cells to the developing parasite.

Brumpt (E.). **Précis de parasitologie. Cinquième édition.** [A compendium of parasitology. Fifth edition.]—xii + 2139 pp., 4 pl. (2 col.), 1073 figs., 2 diags., 6 graphs, 4 maps, Paris, Masson et Cie, 1936. Price Fr. 200.

Part III (pp. 1571–2070) of this comprehensive, fully documented compendium of parasitology, which is stated to have been brought up to date (1935) by an exhaustive perusal of the latest relevant literature, deals with the scientific, clinical, and therapeutic aspects of the fungal parasites of man and animals.

Dowding (Eleanor S.) & Orr (H.). **Three clinical types of ringworm due to Trichophyton gypseum.**—*Brit. J. Derm.*, xlix, 7, pp. 298–307, 2 pl., 2 figs., 1937.

A culture of *Trichophyton gypseum*, the agent of 67 per cent. of all cases of human ringworm in Alberta, Canada [*R.A.M.*, xvi, p. 316], was obtained from scales on the fingers of a female patient and used as the type for the present investigations after verification by other medical mycologists. The subspherical or piriform microconidia (aleuriospores) measured 2·8 to 3·5 by 2·5 μ and the 4 to 10-septate clavate to cylindrical macroconidia (fuseaux) 40 to 75 by 7 to 10 μ; the colonies were light buff-coloured and granular. Fifteen other cultures, isolated from the infected tissues of patients suffering from three different types of ringworm, were also identified as *T. gypseum* on the basis of gross appearance of the cultures, microscopic features of the mycelium and spores, and hyphal fusion with the type culture [ibid., xi, p. 458, *et passim*]. Nine of the cultures differed from the type in the texture (finely granular or silky) or colour of the mycelium (dead white to brownish-vinaceous), pigmentation of the nutrient medium (Morocco red in one instance), or in microscopic characters, such as the absence of macroconidia. In one strain the macroconidia were abnormally short and wide (30 to 40 by 10 to 15 μ). No correlation could be traced between the clinical type of ringworm induced by a given strain and its variations on Sabouraud's medium.

Oyama (T.). **Favus der unbehaarten Haut, durch Achorion gypseum verursacht.** [Favus of the glabrous skin caused by *Achorion gypseum*.]—*Jap. J. Derm. Urol.*, xli, 2, p. 82, 1937.

Achorion gypseum [*R.A.M.*, xvi, pp. 100, 101] was isolated from herpes tonsurans foci in a nine-year-old boy and inoculated with positive results into rabbits, guinea-pigs, rats, mice, and cocks.

Gerencsér (N.). **Gemeinsame Infektion eines ekzematösen Herdes mit Kaufmann-Wolfschem Pilz und Oidium.** [Joint infection of an eczematous focus with the Kaufmann-Wolf fungus and *Oidium*.]—*Börgyógy. Szemle*, xv, pp. 25–26, 1937. [Hungarian. Abs. in *Zbl. Haut- u. GeschlKr.*, lvi, 8, p. 567, 1937.]

Epidermophyton Kaufmann-Wolf [*R.A.M.*, xvi, p. 458] and *Oidium*

[*Candida*] *albicans* were isolated simultaneously from eczematous lesions on the right shin and foot of a female patient. Both hyphae and budding forms were present in the scales.

Ballagi (I.). **Neuere Gruppierung der Dermatophyton-Pilze auf Grund des Systems von Sabouraud.** [A revised classification of the dermatophytic fungi on the basis of Sabouraud's system.] *Orv. Hetil., 1937*, pp. 314–316, 1937. [Hungarian. Abs. in *Zbl. Haut- u. Geschl Kr.*, lvi, 7, p. 480, 1937.]

The writer is persuaded from a study of the systems for the classification of the dermatophytes devised by Sabouraud, Ota and Langeron, Castellani, Grigoraki, and others [cf. *R.A.M.*, xv, pp. 151, 368; xvi, p. 39, *et passim*] that in the interests of both the clinical and microscopic-botanical aspects of the subject, the first-named author's method of grouping should be retained. It is, however, advisable to introduce transitional groups between the four main ones. The pathogenic dermatophytes would thus fall into the following sections: I *Trichophyton* (*a*) of human origin, comprising *T. crateriforme* and its satellites, *T. pilosum*, *T. sulphureum*, *T. exsiccatum*, *T. polygonum*, *T. circonvolutum*, *T. fuscum sulcatum*, *T. cerebriforme*, *T. plicatile*, *T. citreum*, *T. araneideum aurescens*, and *T. infuscatum*; (*b*) of animal origin, including *T. gypseum* and *T. niveum* with their respective varieties, *T. equinum*, *T. vinosum*, and *T. rosaceum*. II *Microsporon* represented by *M. audouini*, *M. umbonatum*, *M. helveticum*, *M. tardum*, *M. pertenue*, and *M. depauperatum*. III *Achorion* (*A. schoenleini* and *A. violaceum*). IV *Epidermophyton*, with *E. inguinale* [*E. floccosum*] and *E. clypeiforme* [*E. floccosum*]. Transitional group 1, characterized from a botanical standpoint by an *Achorion*-like growth habit, comprises *T. violaceum* and its var. *glabrum* [*T. glabrum*], *T. balcaneum*, *T. nigrum*, and *T. faviforme* vars. *album*, *ochraceum*, and *discoides* [*T. album*, *T. ochraceum*, and *T. discoides*]. Group 2, microscopically resembling the animal *T.* strains or *E.* spp., is represented by *M. lanosum*, *M. felineum*, *M. fulvum*, *M. equinum*, *M. villosum*, *M. tomentosum*, *M. pubescens*, *A. quinckeanum*, *A. gypseum*, and *A. gallinae*. Group 3 consists of *Trichophyton*-like species of *Epidermophyton*, viz., Kaufmann-Wolf's fungus, *E.* [*T.*] *interdigitale*, *E.*[*T.*] *rubrum*, *E. plurizoniforme* [*T. rubrum*], *E. lanoroseum* [*T. rubidum*], *E.* [*T.*] *gypseum* and its var. *flavum*, and *E.* [*T.*] *niveum*.

Black (S. H.) & Eddy (Bernice E.). **Human infection with Monilia. Report of a case with cultural data.**—*J. Lab. clin. Med.*, xxii, 6, pp. 584–593, 6 figs., 1937.

Full clinical and cultural data are presented on a case of skin and lung infection, with the production of subcutaneous myxomatous tumours and possible bone involvement, in a negro. The causal organism, which grew well at P_H 3·8 to 5 on Sabouraud's or dextrose tartaric acid agar at 37° C., forming cream-coloured, rugose colonies of oval or rounded budding cells, 8 μ in diameter, produced in older cultures a sparse septate mycelium giving off lateral branches and buds and terminal buds, occasionally accompanied by chlamydospores. Laboratory animals reacted positively to inoculation by the organism, which

is tentatively identified as *Monilia* [*Candida*] *pinoyi* [*R.A.M.*, xv, p. 502].

Martin (D. S.), Jones (C. P.), Yao (K. F.), & Lee (L. E.). **A practical classification of the Monilias.**—*J. Bact.*, xxxiv, 1, pp. 99–128, 3 pl., 1937.

This is an expanded and tabulated account of the writers' studies on 153 unidentified strains of *Monilia* [*Candida*], mostly from human sources in the United States (six from England), which were compared with 19 'known strains' supplied by various investigators. A preliminary report on this work has already been noticed [*R.A.M.*, xvi, p. 381], but the following additional items are of interest. The six species with which all except three of the organisms were found to be identifiable were *C. albicans* [ibid., xvi, p. 748], *C. parapsilosis*, *M. candida* [*C. vulgaris*: ibid., xvi, pp. 40, 99, 177], *C. krusei* [ibid., xvi, p. 611], *M. stellatoidea* Jones and Martin 1937, and *M. mortifera* n. comb. (*Mycocandida mortifera*, *M. onychophila*, *M.* sp., *C. mortifera* and *Monilia onychophila*). *M. stellatoidea* forms a creamy growth on Sabouraud's agar at 37° C., stellate colonies with thick, radiating 'arms' on blood agar, and large, ball-like spore clusters resembling those of *C. albicans* on maize meal agar; acid and gas are produced in the presence of glucose and maltose. The branched mycelium of *M. mortifera* is very similar to that of *C. parapsilosis*; the colonies produced by the former on Sabouraud's agar are creamy, development is poor on blood and maize-meal agars, and glucose, sucrose, and lactose are utilized with acid and gas formation. Full details are given of the authors' technique for the identification of the pathogens under observation.

Coccidioidal granuloma.—*Publ. Hlth Rep., Wash.*, lii, 12, pp. 334–336, 1937.

Following up the investigations of M. Dorothy Beck (1931) on coccidioidal granuloma (*Coccidioides immitis*) in California [*R.A.M.*, x, p. 520; see also xvi, p. 745], the California Department of Public Health has recently issued a further report on the disease (*Wkly Bull. Calif. Bd Hlth*, xvi, 2, p. 6, 1937). Up to 1st July, 1936, 450 cases with 224 deaths were recorded in the State, 301 (66·8 per cent.) originating in Fresno, Kern, Kings, Tulare, and Los Angeles Counties. Males are more liable (384 cases or 85 per cent.) than females to coccidioidal granuloma, especially in the age groups from 25 to 55 (275 cases or 61 per cent.). Of the total number of cases recorded, 65·5 per cent. involved outdoor workers, and the fungus was isolated from soil samples, thus bearing out the theory that it is carried in the soil. Slight variations have occurred in the racial incidence of the disease since 1931, the percentage of foreign-born whites affected having decreased slightly while that of Filipinos has doubled.

Conant (N. F.) & Martin (D. S.). **The morphologic and serologic relationships of the various fungi causing dermatitis verrucosa (chromoblastomycosis).**—*Amer. J. trop. Med.*, xvii, 4, pp. 553–570, 3 pl., 1 fig., 1937.

Thirteen of the 17 strains of fungi from chromoblastomycosis of wide

geographical distribution were shown by comparative studies to belong to *Hormodendrum pedrosoi*, two to *Phialophora verrucosa*, and one each to *H. langeroni* and *H. compactum* [*R.A.M.*, xvi, p. 747]. Full descriptions of these fungi are given. The recognition of the three last-named species presented no difficulties by reason of their distinctive conidiophores, but the classification of *H. pedrosoi* was complicated by its variety of conidial structures. On careful examination, however, the *H.* type of formation was found to predominate in this species, which further produced in 8 of the 13 strains studied phialids terminated by a cup-like formation, identical in size with those of *P. verrucosa* and bearing ovate conidia 2 to 2·5 by 1·5 to 2 μ, probably representing spermatia. *Trichosporium pedrosianum*, *T. pedrosoi*, *Gomphinaria pedrosoi* Dodge 1935, *H. algeriensis* [ibid., vii, p. 639], *Botrytoides monophora*, and *Phialoconidiophora guggenheimia* are all regarded as synonyms of *H. pedrosoi*. Serological studies based on the sera of rabbits immunized with two typical strains of *H. pedrosoi* and one each of the other fungi under observation showed that complement-fixing antibodies were present for the homologous antigen of each fungus. The sera immunized with *H. pedrosoi* and *H. compactum* contained not only a high titre of complement-fixing antibodies for their respective antigens but also for each other, whereas in the cases of *P. verrucosa* and *H. langeroni* the antibodies were present in appreciable degree only for the homologous species.

Crowell (I. H.). **Relative susceptibility of Lilac species and varieties to Microsphaera alni.**—*Plant Dis. Reptr*, xxi, 8, pp. 134–138, 1937. [Mimeographed.]

A list is given, based on studies made from 1933 to 1936 at the Arnold Arboretum, of about 300 species and varieties of lilac classified as immune from, or slightly, moderately, or highly susceptible to, powdery mildew (*Microsphaera alni*).

Ullstrup (A. J.). **Histological studies on wilt of China Aster.**—*Phytopathology*, xxvii, 7, pp. 737–748, 5 figs., 1937.

The roots of healthy China aster (*Callistephus chinensis*) plants resistant to wilt (*Fusarium conglutinans* var. *callistephi*) [*R.A.M.*, xvi, p. 256] were anatomically indistinguishable from those of healthy susceptible varieties. Penetration of the latter is effected largely between the root cap cells and the epidermal cells in the region of elongation. Occasionally direct penetration of the outer wall of an epidermal cell was observed, but initial ingress through root hairs was not detected. Penetration in the resistant strain was very limited in extent but did not differ in manner or situation from the process in susceptible varieties. In old susceptible plants in wilt-infested soil considerable decay of the meristem and part of the region of elongation followed penetration, but hyphal extension occurred chiefly in the xylem. At an advanced stage of the disease the mycelium migrated into other stelar tissues and invaded the secondary roots, but the cortex was only slightly involved until wilting became complete. Resistant plants grown in infested soil for over three months developed a few restricted root lesions. No morphological barrier to the advance of the

hyphae could be detected, and resistance is therefore presumably attributable, as in the case of other vascular *Fusarium* wilts, to physiological properties of the host protoplasm.

Downy mildew on China Aster in Texas.—*Plant Dis. Reptr*, xxi, 8, p. 141, 1937. [Mimeographed.]

All the China aster (*Callistephus hortensis*) [*C. chinensis*] plants in the fields of a commercial grower in Hidalgo County, Texas, were affected by *Basidiophora entospora* Roze & Cornu which caused a loss of about 30 per cent., though injury was reduced by the application of Bordeaux mixture and copper dusts. This would appear to be the first record of a downy mildew on this host, at least in the United States.

Some diseases reported on ornamentals.—*Plant Dis. Reptr*, xxi, 13, p. 251, 1937. [Mimeographed.]

Among the diseases recorded in this paper are *Cercospora nymphaeacea* Cke & Ell. found on water lily (*Nymphaea mexicana*) in Texas, and *Guignardia bidwellii* [*R.A.M.*, xvi, p. 17] on *Ampelopsis* [*Parthenocissus*] *tricuspidata* in the District of Columbia.

Van Eek (T.). **Wortelrot van Viola tricolor L. max. hort.** [Root rot of *Viola tricolor* L. *max. hort.*]—Thesis, Univ. of Amsterdam, 83 pp., 9 pl., 7 graphs, 1937. [English summary.]

In most cases of damping-off of seedlings and wilting, foliar discoloration, and arrested development of older plants of cultivated pansies (*Viola tricolor* and other *V.* spp.) in Holland, the root system is extensively involved. Among the 45 fungi isolated on 2 per cent. plain or cherry agar may be mentioned *Pythium de Baryanum* [*R.A.M.*, xiv, p. 38], *P. aphanidermatum*, *P. perniciosum*, *P. intermedium* [ibid., viii, p. 187], *P.* spp. A and B, *Brevilegnia gracilis* n.sp., *B. macrospora* n.sp. [both with Latin diagnoses], *Fusarium culmorum*, *F. bulbigenum*, *F. oxysporum*, *F. solani* vars. *martii* and *minus*, *F. equiseti*, *F. scirpi* and its var. *filiferum*, *Cylindrocarpon radicicola* [ibid., xv, p. 605], *C. didymum*, *C. obtusispora*, *Septomyxa affinis* [ibid., viii, p. 342], *Rhizoctonia* [*Corticium*] *solani* [ibid., xv, p. 705], and *Thielavia basicola* [ibid., xv, p. 467]. Of these the most virulent were experimentally shown to be *P. de Baryanum*, *P. aphanidermatum*, *P. perniciosum*, *B. gracilis*, *F. culmorum*, and *C. solani*.

B. gracilis is characterized by branched hyphae, 2 to 5 μ in diameter, cylindrical sporangia, 60 to 75 by 12 to 15 μ, non-motile spores, 4 to 7 μ in diameter, usually terminal oogonia, 17 to 30 μ in diameter, average 20 to 27 μ, with one or occasionally two oospores, not completely filling the oogonium, 15 to 24 μ in diameter, mostly 17 to 21 μ, and both diclinous and androgynous antheridia (one or two per oogonium), 15 to 30 by 7 to 10 μ. In *B. macrospora* the hyphae are also branched, 2 to 5 μ in diameter, the cylindrical sporangia measure 70 to 80 by 12 to 15 μ and contain 30 to 50 spores, 4 to 7 μ in diameter; the terminal or intercalary oogonia (usually the former) are 18 to 40 μ in diameter, average 26 to 31 μ, with one or rarely two oospores, 15 to 28 μ in diameter, mostly 20 to 24 μ, not entirely occupying the oogonium, and there are diclinous, mostly terminal antheridia, generally one or two

per oogonium. Both species of *Brevilegnia* also form germinable bodies of an indeterminate nature; in the case of *B. gracilis* they are darker in colour than the other organs of the fungus, while in that of *B. macrospora* they are round to cylindrical, 30 to 75 by 20 to 30 μ. *P.* sp. A lacks sporangia, oogonia, and antheridia, the terminal or intercalary conidia measure 16 to 38 μ in diameter (mean 26 μ), and, according to S. F. Ashby, agree with those of *P. de Baryanum* var. *pelargonii* [ibid., x, p. 732]. In *P.* sp. B sporangia are also absent; the oogonia are usually terminal, 15 to 38 μ in diameter, mostly 25 to 31 μ, and contain one oospore, 13 to 32 μ in diameter, and one or two antheridia, 10 to 17 by 6 to 9 μ. The hyphae of both species are 2 to 5 μ in diameter.

In inoculation experiments on Schneewittchen and Rotkäppchen pansies in pots of sterilized and unsterilized soil the pathogenicity of *T. basicola*, described by Thaxter (*Rep. Conn. agric. Exp. Sta.*, p. 161, 1891) and Reddick (*Trans. Mass. hort. Soc.*, p. 85, 1913) as an agent of root rot in the United States, was inconsiderable. The virulence of the *Cylindrocarpon* spp. used in the tests declined progressively in culture and no infection was obtainable after a year. All the above-mentioned *F.* spp., when grown on a rice medium, formed substances highly toxic to the pansy; in soil inoculations these are introduced with the pathogens into the substratum and tend to obscure the symptoms of exclusively fungal origin. A culture of *F. culmorum* a fortnight old proved highly pathogenic in soil inoculation tests, whereas one of a month caused no infection. Few or no symptoms developed, moreover, on plants raised from seed inoculated with a rice culture of *F. culmorum* and left to germinate in the soil. This loss of virulence is attributed to deterioration, induced by exhaustion of the food supply, adverse changes in reaction, and the elaboration of specific substances toxic to the fungus itself (staling) [ibid., ii, p. 328, *et passim*]. All the Phycomycetes isolated during these investigations were generally much less active in unsterilized than in sterilized soil, and the infective capacity of *B. gracilis* was completely inhibited by simultaneous inoculation of the soil with a rice culture of *S. affinis* on rice, but not with the same organism on 2 per cent. agar. Infection with *F. scirpi* and its var. *filiferum* and *F. equiseti*, however, was more severe in unsterilized than in sterilized soil.

Owing to the large number of fungi involved and to the influence of environmental factors, it is difficult to correlate a given symptom with a definite pathogen. *Fusarium* infection, however, is generally recognizable by the discoloration and stunting of the foliage and petioles. *F. culmorum* is an exception to the rule, causing rapid and intensive wilting and root decay, though the plants may recover if the fungus is exposed to unfavourable conditions.

Pape (H.). **Stammfäule der Gloxinie und ihre Verhütung.** [The stem rot of *Gloxinia* and its control.]—*Blumen- u. PflBau ver. Gartenwelt*, xli, 27, pp. 306–307, 4 figs., 1937.

A species of *Phytophthora*, the exact identity of which is still uncertain, is responsible for increasingly heavy damage to *Gloxinia* in north Germany, where a large nursery recently reported the collapse of over 2,000 half-grown plants from the soft brownish- to greenish-black

stem rot due to the fungus [cf. *R.A.M.*, xiv, p. 637; xv, p. 478]. Infection appears to be favoured by excessive humidity and insufficient aeration of the stem base associated with the use of impermeable soil, too copious watering, heavy shading, dense planting, inadequate greenhouse ventilation, and unbalanced nitrogenous manuring. The blue-flowered types appear to be particularly susceptible to stem rot and the white ones very resistant; in general the disease is most severe on highly cultivated selections and spares the ordinary commercial varieties such as Kaiser Friedrich, Kaiser Wilhelm, and Defiance. Control measures, based on the avoidance of the above-mentioned cultural errors, are briefly indicated.

Green (D. E.). **Downy mildew on Antirrhinum majus.**—*Gdnrs' Chron.*, cii, 5037, pp. 27–28, 1937.

After pointing out that downy mildew (*Peronospora antirrhini*) of cultivated *Antirrhinum majus* plants was first reported in the British Isles from southern Ireland in May, 1936, the author states that in June, 1937, severely affected plants were received at the Royal Horticultural Society's laboratory at Wisley from three sources in one locality in England. The disease causes a marked check to the growth of the young shoots. In young plants the lower leaves are of normal size, while the upper parts consist of very small leaves on shortened shoots, these leaves curling downwards and inwards at the tips, with the result that the plants present a crippled, stunted appearance. A few varieties show a fairly long central stem with small, curled leaves. The affected plants tend to break from the base and produce numerous secondary shoots. From the information available it appears that the disease attacks young nursery stock, on which it should be sought; infected plants should be destroyed and the remainder sprayed with Burgundy mixture.

Harrar (J. G.). **Some unusual diseases of ornamentals in Virginia.**—*Plant Dis. Reptr*, xxi, 11, p. 217, 1937. [Mimeographed.]

Snapdragon [*Antirrhinum majus*] growing in the greenhouse in Virginia under conditions of high temperature and humidity became blighted as a result of infection by a species of *Cladosporium*, the pathogenicity of which was established. Small pustules developed on the leaves and stems, covering the former under optimum conditions. Stem canker and leaf spot of the same host in the field and in greenhouses were caused by a species of *Phoma*, pycnidia of which occurred on the stems, pods, and leaves of all affected plants [cf. *R.A.M.*, x, p. 130]. Seven distinct strains of *Verticillium* [ibid., xiii, p. 737] were found to be associated with blue rot of box (*Buxus sempervirens*), of which three were ascertained by inoculation tests to be actively parasitic.

Beaumont (A.) & Gregory (P. H.). **A new leaf-spot disease of Gerbera.**—*Gdnrs' Chron.*, cii, 5037, p. 28, 1 fig. [on. p. 29], 1937.

In 1936, *Gerbera jamesoni* hybrids growing near Penzance were slightly affected by *Ascochyta gerberae* Maffei which produced on the leaves brown, minutely granular spots, 2 to 10 mm. in diameter and surrounded by a purple margin most conspicuous in the early stages.

The spots subsequently coalesced, and many of the older leaves shrivelled up. This appears to be the only record of the disease since its original appearance in Italy in 1912.

Dodge (B. O.). **A dry-rot disease of Opuntia.**—*J. N. Y. bot. Gdn*, xxxviii, 451, pp. 170–172, 1 fig., 1937.

Prickly pear (*Opuntia*) segments collected in the Rocky Mountains, New Mexico, in 1936 and destined for propagation became covered with coalescent, black spots, each surrounded by a brown zone $\frac{1}{16}$ in. wide, which in turn was encircled by a pale yellowish band of similar extent, presumably representing, respectively, the intermediate stage and final limits of fungal extension. The black area was densely studded with minute, black pycnidia, or possibly spermogonia. The mycelium was mostly situated in the epidermis, which it completely destroyed, so that the fungus appeared subcuticular. Eventually a tough, black, crust-like dry rot spread completely over one side of the segments. The disease is stated to be capable of completely destroying plants of the variety from New Mexico under favourable conditions.

Weimer (J. L.). **Effect of the dwarf disease on the Alfalfa plant.**—*J. agric. Res.*, lv, 2, pp. 87–104, 10 figs., 1937.

The histological studies discussed in this paper showed that the more or less extensive yellow discoloration of the wood in the roots of lucerne plants affected with dwarf disease [*R.A.M.*, xvi, p. 103] is largely due to the presence of gum, similar in character to wound gum, in the vessels; in the late stages of the trouble, however, there is also a yellow stain which diffuses into the surrounding tissues. At first the gum is limited to a few vessels in one or more bundles of the outer xylem in the upper part of the tap-root or crown, but before death of the plant the whole root system is involved, many of the vessels in the outer xylem being completely plugged with the gum. Some of the gum is evidently exuded by adjacent cells into the vessels, where it appears in the form of globules or thin sheets along the inner surface of the walls. Certain vessels contain numerous bacterium-like bodies, very similar, chemically, to the gum in which they are embedded, and differing from bacteria in several respects.

The water content of the tops of healthy lucerne plants was found to be slightly higher than that of diseased tops, the reverse applying to the roots. Healthy plants transpired about 1·6 times as fast as the diseased, the same difference being also found in the amount of water that could be pulled through segments of healthy and diseased roots of approximately equal diameter. Differences in acidity observed between the healthy and diseased plants were probably due to a difference in growth. Roots and tops affected with dwarfing had a higher ash content than healthy plants grown under similar conditions, and it was shown that in diseased roots starch gradually diminishes until it finally disappears just before the lucerne plant dies.

Klinkowski (M.) & Lehmann (H.). **Kranke Luzerne.** [Sick Lucerne.] —132 pp., 16 figs., Neudamm, J. Neumann, 1937. Price RM. 4.50.

In view of the increasing cultivation of lucerne in Germany, the

authors present a practical manual describing the diseases and pests of the plant and indicating measures for their control. The diseases discussed include certain disorders of physiological origin, mosaic, and 14 due to fungi, and a useful key for their determination by symptoms is furnished.

McWhorter (O. T.). **Zinc sulfate treatments for 'little leaf' condition of deciduous fruits.**—*Rep. Ore. St. hort. Soc. 1936*, pp. 121–124, [? 1937. Abs. in *Chem. Abstr.*, xxxi, 16, p. 5931, 1937.]

Zinc tacks, placed 0·5 in. apart and arranged spirally round the tree, are recommended for the control of little leaf in small deciduous fruit trees [*R.A.M.*, xiv, p. 768; xvi, p. 755]. Zinc sulphate sprays (10 to 12 lb. crystallized zinc sulphate plus 5 lb. lime per 100 galls.) give satisfactory results when there is risk of foliar scorching. Severely affected trees are greatly benefited by spraying with zinc sulphate (1 lb. per 100 galls.) with or without lime. In old trees the condition may be combated by boring holes 1·5 in. deep and 0·375 in. in diameter, spaced 4 to 5 in. apart, round the tree trunk at soil-level and filling with zinc sulphate crystals to within 0·5 in. of the outside.

Kearns (H. G. H.) & Marsh (R. W.). **A summary of fruit spraying programmes. I.**—*Rep. agric. hort. Res. Sta. Bristol, 1936*, pp. 75–89, [1937].

In connexion with the spray service recently instituted by the Long Ashton Research Station in collaboration with the County Agricultural Departments of the Bristol Advisory Province, a summarized account is given of the standard spray programmes at present in use in the Province against pests and diseases of apple, pear, plum, cherry, black and red currants, gooseberry, raspberry, loganberry, blackberry, and strawberry. These programmes are designed to supplement information that is to be issued each season through the service and to inform the growers beforehand of the materials likely to be required.

Kearns (H. G. H.), Marsh (R. W.), & Martin (H.). **Combined washes. Progress report. III.**—*Rep. agric. hort. Res. Sta. Bristol, 1936*, pp. 99–117, [1937].

Further extensive field trials with combined insecticidal-fungicidal sprays carried out during 1936 at Long Ashton and elsewhere [*R.A.M.*, xv, p. 735] demonstrated that in general a wash containing lime-sulphur and a refined (grade G) petroleum oil emulsified with sulphite lye may be safely applied to apple varieties tolerant of sulphur, though the addition of the emulsion did not increase the control of scab [*Venturia inaequalis*]. In one trial in which the oil was included in all the sprays against scab serious defoliation resulted, but sufficient successful experiments have now been carried out to permit the combined wash to be recommended for those circumstances in which it can economically replace separate insecticidal and fungicidal sprays.

Swarbrick (T.). **The effect of spraying methods upon the cost of applying fruit tree washes.**—*Rep. agric. hort. Res. Sta. Bristol, 1936*, pp. 139–148, [1937].

In an extensive investigation carried out at Long Ashton from 1928

to 1935, inclusive, the cost and efficiency of the semi-portable and mobile systems of orchard spraying are compared in considerable detail, the relevant data being tabulated [cf. *R.A.M.*, xvi, p. 547]. The semi-portable spraying unit consisted of a moveable 3½ h.p. sprayer working at 250 lb. pressure with a maximum output of 7 galls. per minute, to which were attached overground steel mains or long lengths of rubber hose. This apparatus was used as a mobile unit in 1930–2, and in 1933–6 a large mobile unit, with an 8 h.p. sprayer delivering 20 galls. per minute, was employed. The results showed that the semi-portable system required at least six men, and gave a slow rate of spraying owing to the time lost in moving the pipes. The adoption of the mobile system reduced the number of workers required to three at most and halved the time necessary to spray a given plot, with the result that the cost of application was greatly reduced. The cost of labour and horse or tractor hire for spraying a plot of 2 acres of mature bush apples using the semi-portable system ranged from £3 17*s.* 6*d.* per application in 1928–9 to £2 in 1931–2, while in 1933–4 and 1934–5, using the mobile system and the same heavy application the cost was, respectively, £1 9*s.* 9*d.* and £1 4*s.* 3*d.*; in 1935–6 a much lighter application, using the mobile system, cost only 17*s.* 8*d.* With the mobile system and suitable spray guns each worker has an output of 10 to 14 galls. per minute; on mature bush apples and pears outputs of 6 to 8 galls. per minute per man have been maintained at Long Ashton since 1933. On large standard trees in grass orchards far larger outputs are obtained.

Goodwin (W.), Pizer (N. H.), Salmon (E. S.), & Ware (W. M.). **The control of Apple scab: Allington Pippin and Newton Wonder, 1936.**—*J. S.-E. agric. Coll., Wye*, xl, pp. 9–17, 1937.

In further comparative spraying tests against apple scab [*Venturia inaequalis*: *R.A.M.*, xv, p. 813] conducted in Kent in 1936, Allington Pippin trees given two pre- and two post-blossom applications of home-made Bordeaux mixture (8 : 12 : 100) and cotton-seed oil Bordeaux emulsion (as used in previous tests) gave, respectively, 17·4 and 22·3 per cent. scabbed apples, as against 88·5, 65·7, and 86·6 scabbed fruits in three unsprayed control plots. Newton Wonder trees similarly treated gave, respectively, 30 and 36·9 per cent. scabbed apples as against 92·9, 63·2, and 89·4 per cent. scabbed fruits in three unsprayed control plots.

Owing, possibly, to the very wet season, the Bordeaux mixture and the cotton-seed oil Bordeaux emulsion caused, respectively, 15·1 and 6·2 per cent. russeting on the Allington Pippin crop; on the Newton Wonder apples russeting was negligible. Scab infection was early in 1936 and the parts affected included sepals, petals, and stamens. Reviewing the results obtained in 1933–6 the authors consider that cotton-seed oil Bordeaux emulsion is probably not inferior as a fungicide to Bordeaux mixture.

Rothe (G.). **Mineralöle im Pflanzenschutz II.** [Mineral oils in plant protection. II.]—*NachrBl. dtsch. PflSchDienst*, xvii, 6, pp. 46–48, 1937.

Certain points of interest in connexion with the phytopathological

use of mineral oils are briefly referred to in this paper. Improved control of apple scab (*Fusicladium*) [*Venturia inaequalis*: *R.A.M.*, xvi, p. 685] was obtained on White Transparent and Altland Pancake by the admixture of oil with the Bordeaux mixture spray as follows: 5 per cent. winter oil A + 2 per cent. Bordeaux on 15th April, 2 per cent. summer oil + 1 per cent. Bordeaux on 5th May, and 2 per cent. summer oil + 0·3 per cent. Bordeaux on 3rd and 26th June. The percentage of healthy White Transparent fruits harvested from the plot so treated was 88·4 compared with 2·0, 36·3, and 14·5 from those left unsprayed, receiving the fungicide alone, and treated with oil alone, respectively, while the percentage of severe scab was only 0·8 as against 58·5, 5·2, and 7·1, respectively, for the other treatments. In the case of Altland Pancake 85·2 per cent. of the combined oil and fungicide-treated fruits were healthy compared with 6·0, 76·4, and 23·4 for the control, Bordeaux alone, and oil alone plots, respectively, and there was only 0·3 per cent. severe infection as against 37·1, 1·2, and 5 per cent., respectively, for the other treatments.

Birmingham (W. A.). **Soft or deep scald of Apples.**—*Agric. Gaz. N.S.W.*, xlviii, 7, pp. 397, 406, 2 figs., 1937.

The apple variety most susceptible to soft or deep scald [*R.A.M.*, xv, p. 300; xvi, p. 687] is stated to be Jonathan, but the condition has also been recorded in Australia on Rome Beauty, Stone Pippin, Dunn's, Stayman-Winesap, Winesap, Northern Spy, Northwestern Greening, Wealthy, and Blue Pearmain. It is generally characterized by patches or banded areas of slightly depressed brown tissue, partly or completely encircling the surface of the apple. Jonathan apples become affected if picked too early. Delayed storage strongly favours the condition, which develops chiefly at temperatures under 36° F., especially those approaching freezing point. Control consists in timely picking, immediate cold storage at a temperature not below 36°, and aeration with ventilation in cool storage.

Savage (C. G.) & Broadfoot (H.). **Internal cork of Apples. Soil dressings of borax give excellent results.**—*Agric. Gaz. N.S.W.*, xlviii, 7, pp. 387–390; 8, pp. 447–452, 12 figs., 1937.

Complete control of internal cork [*R.A.M.*, xvi, p. 686] on Granny Smith and Democratic apples growing in New South Wales orchards where the disease had long been present was given by soil applications of 1 to 3 lb. of borax per tree. Two Granny Smith trees each given 1 lb. borax and 1 cwt. sheep manure yielded, respectively, 17 and 15 bushels of sound fruit, as against only 24 bushels for 19 trees not given borax. When ¼ oz. dry, granulated borax was inserted in the root of one tree, sound fruit developed only on the same side as the hole, but the root was badly damaged. The treated trees made much more annual growth and had darker foliage and better-coloured fruit than the untreated, the foliage and fruit also remaining attached longer on the former than the latter. No trace of the disease was found on 16 varieties, including Delicious, Northern Spy, and Winesap, whereas Granny Smith, Milbert, and Fameuse were severely affected.

The authors recommend that the trees should be given an application

of $\frac{3}{4}$ to 1 lb. borax in early spring, and that the mechanical condition of the soil should be improved by a dressing of 3 to 5 tons of organic manure per acre or by sowing and ploughing in leguminous green manures.

WALLACE (T.). **Orchard factors affecting the quality of fruits.**—*J. Soc. chem. Ind., Lond.*, lvi, 31, pp. 695–697, 1937.

In connexion with a general discussion of certain inherent, environmental, and cultural factors affecting the quality of fruits (especially apples), the writer states that the practice of bark-ringing induces extreme susceptibility to superficial scald, flesh breakdown, and 'cork', while superficial scald is also favoured by unduly early picking. Apples exposed to the maximum of sunshine have been found more susceptible to bitter pit [*R.A.M.*, xvi, p. 688] than shaded ones, which tend to suffer from storage rots (including *Gloeosporium album*) [ibid., xvi, p. 756]. Storage rots are also prevalent on terminal fruits. Flesh breakdown and bitter pit frequently occur on large fruits and on those from light crops, the former also being invaded by rots, while core flush is a defect of small apples [ibid., xvi, p. 260].

RAMSEY (G. B.). **Fruit and vegetable diseases on the Chicago market in 1936.**—*Plant Dis. Reptr, Suppl.* 101, pp. 81–96, 1937. [Mimeographed.]

In these notes on a large number of fruit and vegetable diseases observed in the Chicago market during 1936 it is stated that the most interesting decay of pears noted was *Sporotrichum* [cf. *R.A.M.*, x, p. 675] rot of Anjou pears from Medford, Oregon, marketed in February. Up to 40 per cent. of the fruits in some boxes showed dark brown to black, circular, depressed spots $\frac{1}{4}$ to $1\frac{1}{4}$ in. diameter, and $\frac{1}{4}$ to $\frac{1}{2}$ in. deep. The affected internal tissues were yellowish-to dark brown, and soft to spongy, according to size. At room temperature many of the spots increased in diameter at the rate of 1 mm. per day.

A few Californian tomatoes received in October showed minor blemishes due to *Bacterium punctulans* [ibid., xiii, p. 279].

BODINE (E. W.) & DURRELL (L. W.). **The Maynard Plum—a carrier of the Peach mosaic virus.**—*Science*, N.S., lxxxvi, 2221, p. 81, 1937.

Buds from each of six externally normal Maynard plum trees growing in a peach mosaic-infested area of the Palisade district, Colorado [*R.A.M.*, xvi, pp. 88, 543], were grafted on 4th September, 1936, into five one-year-old peaches. On the commencement of growth in the following spring, 15 seedling peaches grafted with buds from parent plum trees Nos. 1, 5, and 6 showed typical mosaic symptoms, while 15 others grafted with buds from plum trees 2, 3, and 4, and also 28 peach seedlings used as controls remained healthy. This experiment was carried out in an isolated planting remote from the mosaic centre.

On 23rd March, 1937, roots from the six Maynard plums were grafted on roots of 34 two-year-old peach seedlings. Peach mosaic symptoms were observed on the following 15th May on 15 of the 17 peach trees root-grafted from plums 1, 5, and 6, while the 17 grafted with plums 2, 3, and 4, and 33 peach seedling controls remained normal.

Maynard plums may thus apparently be carriers of the peach mosaic virus without showing any pathological symptoms.

Willison (R. S.). **Peach canker investigations. III. Further notes on incidence, contributing factors, and related phenomena.**—*Canad. J. Res.*, xv, 7, pp. 324–339, 1 diag., 4 graphs, 1937.

In summarizing the results of intensive annual surveys from 1929 to 1936, inclusive, in the laboratory orchards at St. Catharines, Ontario, in relation to peach canker (*Valsa cincta*) [*R.A.M.*, xiii, p. 246; xv, p. 447], the author states that the relative importance of the different primary sources of the cankers varies from year to year. During the first two or three years from planting, pruning wounds and injuries following *Verticillium* wilt [ibid., xiii, p. 246] usually serve as the main means of entry for canker, but with the development of a profusely branching aerial system, other points of origin, such as dead twigs and fruit pedicels, become dominant and either continue to increase in importance from year to year or are in their turn superseded by others. Still other sources, such as mechanical injuries, winter injuries, reinfections following the removal of cankers, split or broken branches, crotches, and borer insect injuries, did not show any definite trend, but varied in importance according to conditions prevailing in the different years. Cankers which in the earlier communications had been described as originating from dead buds, have since been shown to have been leaf scar infections, the indications being that these scars remain vulnerable for a time after leaf fall, because of a temporary absence of wound periderm in the leaf base; there was evidence, however, that the development of scars from this source is dependent on an infrequent coincidence of physiological and meteorological factors. Some insects, such as the oriental fruit moth (*Laspeyresia molesta*), the shot-hole borer (*Scolytus rugulosus*), and the peach borer (*Synanthedon exitiosa*) may cause injuries which frequently become cankered later; the lesser peach borer (*S. pictipes*) is seldom a primary parasite but may stimulate the necrotic processes by destroying the callus in existing cankers. Pruning experiments indicated that wounds made during the autumn were most susceptible to natural infection with the canker organism. Serious cankers may also arise from winter injury, three types of which at least were observed, and the incidence of peach canker and winter injury may be significantly increased by prolonging the period of open cultivation. It was further established that from 75 to 85 per cent. of the open cankers of all ages overwintering on the trees remain active, the general tendency, however, being for the cankers to become less active with increasing age. The paper terminates with a brief discussion of control measures, the conclusion being that surgical treatment of important cases, combined with the dressing of the wound with disinfectants, is of considerable value.

Salmon (E. S.) & Ware (W. M.). **The honey fungus (Armillaria mellea) attacking fruit trees and Hops; with observations on Pholiota squarrosa in Cherry orchards.**—*J. S.-E. agric. Coll., Wye*, xl, pp. 18–26, 6 figs., 1937.

Armillaria mellea [*R.A.M.*, xvi, p. 716] is not so common on fruit

trees in south-eastern England as might be supposed, but during the last seven years three serious outbreaks have occurred, and are here recorded in detail.

The first took place in a mixed orchard of cherry, apple, and plum trees at Faversham, Kent, where 14 dead or dying cherry trees, 25 to 30 years old, were removed in 1929, and several apple trees and one plum tree were attacked the following year, infection having spread from five or six old elm stumps in the vicinity. The second occurred in 1933 on large cherry trees at Sittingbourne, Kent, sometimes in association with *Pholiota squarrosa* [ibid., xiv, p. 803], which was destructive in the same orchard in 1931, where *Ganoderma applanatum* was also commonly present in 1932. *A. mellea* was also found fruiting near dead plum trees which had replaced cherries grubbed in 1931–2, proceeding directly from the old cherry roots. The third outbreak of *A. mellea* caused considerable damage to old apples, plums, and damsons at Wye, and grubbing has been necessary every year since 1933.

In 1935, Fuggle hops at Goudhurst were attacked by *A. mellea* [ibid., xv, pp. 478, 605] and in 1936, *P. squarrosa* was widely present on old, dying cherry trees at Tenterden.

Swarbrick (T.) & Berry (W. E.). **Further observations on the incidence and spread of reversion and big bud in Black Currants.**— *Rep. agric. hort. Res. Sta. Bristol, 1936*, pp. 124–132, 1 fig., [1937].

After pointing out that the available evidence suggests that reversion in black currants [*R.A.M.*, xv, p. 731] is due to a virus and may be spread by the black currant mite (*Eriophyes ribis*) causing big bud, the authors present data obtained over a period of eight years in a large plantation which showed that when reverted bushes were planted in fixed positions the new cases that occurred arose mostly in close proximity to them. Edina black currants appeared to be more, and Baldwin less, susceptible to reversion than French. Big buds developed almost exclusively on reverted bushes, but not before reversion had become apparent. It would appear that many new infections arise through the activities of *E. ribis*, but the disease may perhaps be spread by other means, and it is possible that the bushes that became affected had the disease in a latent form when planted.

Richards (B. L.) & McKay (H. H.). **Strawberry root rot in Utah.**— *Proc. Utah Acad. Sci.*, xiii (*1935–6*), pp. 17–19, 1936. [Abs. in *Exp. Sta. Rec.*, lxxvii, 3, p. 354, 1937.]

Isolations from over 4,000 root-rotted strawberry plants in Utah [*R.A.M.*, xvi, p. 760] most commonly give *Fusarium orthoceras* and species of *Rhizoctonia*, *Cylindrocarpon*, *Hainesia*, and *Coniothyrium*. Inoculation experiments showed that the first-named fungus, *R.* [*Corticium*] *solani*, and *Cylindrocarpon obtusisporum* induce typical black rot, while *Hainesia* may be partly responsible for the condition. Locally, all four are prevalent in the soil. *Olpidium brassicae* and a Phycomycetous mycorrhizal fungus [ibid., xv, p. 449] were also found in the cortical layers of the affected roots.

Anagnostopoulos (P. T.). *Ἡ κερκοσπορίωσις τῆς Σγκῆς (Φυλλόπτωσις, σῆψις καρπῶν).* [Cercosporiosis of the Fig (phylloptosis, sepsis of the carpels).]—*Hort. Res., Athens, 1936*, 4, pp. 170–175, 3 figs., 1936. [English summary. Received October, 1937.]

Cercospora bolleana is reported to have been responsible for a serious leaf fall and fruit rot of figs [*R.A.M.*, v, p. 584] in Messenia, Greece, in the autumn of 1935 and the summer of 1936. The disease may be combated by two applications of Bordeaux mixture (2–2–100) in May and June, followed by others if rainy weather ensues.

Stevens (H. E.). **Control of Mango blossom-blight and anthracnose.**—*Proc. Fla hort. Soc.*, xlix, pp. 125–130, 1936. [Abs. in *Exp. Sta. Rec.*, lxxvii, 3, p. 355, 1937.]

Tests carried out in Florida with different fungicides showed that good commercial control of mango blossom blight and anthracnose [*Glomerella cingulata*: *R.A.M.*, xv, p. 592] was given by four to five applications of Bordeaux mixture (4–4–50). The dormant spray is necessary as a clean-up treatment and to protect the bloom cluster during its early stages. Copper-lime dust (20–80) gave very good control under some conditions but was difficult to apply except in still air.

Rada (G. G.). **La enfermedad de la antracnosis del Palto en Moquegua.** [The anthracnose disease of Avocado in the Moquegua valley.]—*Cart. Minist. Fom., Lima*, 30, 22 pp., 11 figs., 1937.

A phytopathological inspection in 1935 of 16 orchards in the valley of the Moquegua, which is stated to be the chief centre of avocado cultivation in Peru, showed that from 10 to 100 per cent. of the avocado trees in them were infected with anthracnose (*Physalospora* [*Melanops*] *perseae*) [*R.A.M.*, ix, p. 63; cf. ibid., xiv, p. 124], the symptoms caused by which are popularly described. Recommendations for the control of the disease include the elimination of badly diseased trees, surgical treatment of the others, and periodical applications of 1 per cent. Bordeaux mixture. [Control measures against this disease have now been made compulsory: *Int. Bull. Pl. Prot.*, xi, 8, p. 182, 1937.]

Davies (C.) & Smyth-Homewood (G. R. B.). **Investigations on machinery used in spraying. Part IV. Nozzles.**—*J. S.-E. agric. Coll., Wye*, xl, pp. 50–57, 9 graphs, 1937.

In these further studies [*R.A.M.*, xvi, pp. 396, 694] the authors describe how variations in the details of spray nozzles influence spray form and general performance.

It was found that a vortex plate with six 11/64 in. holes drilled at 45° gave a more symmetrical spray pattern than one with four 14/64 in. holes, and both gave a more even spray than a 2-hole plate. The insertion of a central hole to both 4- and 6-hole vortex plates increased range and output, provided the disk orifice was large enough to take the greater flow. The dimensions of the orifice in the disk of a nozzle limit the output, whatever the number and size of the vortex holes. Atomization and carry were appreciably affected by the design of the vortex plate even when the disk reached its limit of output.

With increasing size of nozzle disk (up to 18/64 in.), using a 4-hole

vortex plate, output increased as the outlet in the disk was enlarged, but the range fell progressively with increased apertures after a certain maximum size was reached, owing to the wide cone of spray produced by the large apertures. When, however, a vortex plate was used provided with an opening drilled axially, the reduction in range was followed by an increase in the case of the largest disks. The spray became progressively finer as the total area of the vortex holes became smaller and the pump pressure greater.

The diameter of the eddy-chamber had no effect on spray formation so long as the distance between the vortex holes remained unchanged and all other factors constant, but the nearer the vortex holes were to the centre of the plate ($2\frac{1}{4}$ in. diameter) the greater were the output and carry, though there appeared to be no difference in atomization. When the number of vortex holes was increased to sixteen (each 6/64 in.) the symmetry of all the patterns produced was nearly perfect with all pump pressures and sizes of disk orifice. Both the output and range were greater with 4 holes in the vortex plate than with 16.

Taylor (G. G.). **Application of orchard sprays. IV. Spray coverage.**— *N.Z.J. Agric.*, lv, 1, pp. 32–41, 5 graphs, 1937.

In the experiments discussed in this, the fourth paper of this series [*R.A.M.*, xvi, p. 694], a spray consisting of 7·5 lb. hydrated lime in 100 galls. water was used to study the bearing of volume delivery at the nozzle and duration of spraying on the coverage of the foliage with the spray. The differences in coverage were ascertained by observation and by chemical estimation of the weight of calcium hydroxide residue on disks of sprayed leaf tissue, sixty disks being taken from each tree. The results showed that spray coverage, and hence control efficacy of insecticidal and fungicidal sprays, are markedly influenced by volume application, which, in its turn, is a function of duration of spraying and volume delivery. The time spent in spraying is a variable factor in practice, chiefly dependent on the size of the tree and to a lesser degree on the personal factor of the operators, but for practical purposes may be defined as the maximum working speed, and volume delivery becomes the significant factor determining volume application. As indicated by the test results, the optimum volume delivery for general orchard spraying is from 3 to 3·5 galls. per minute, but for large trees it could be raised to 4 to 4·5 galls. with advantage.

Further experiments showed that spray coverage is also largely influenced by the conditions under which the spray is applied and by the nature of the surface sprayed. An improvement in cover for smooth surfaces (e.g., most apples) may be obtained by the use of a nozzle or combination of nozzles forming fine droplets of spray and by applying the spray under high pressure (250 to 300 lb.) with the nozzle held sufficiently distant from the fruit to avoid removal of the spray by the blowing effect of high pressure. These conditions also give the best results on 'waxy' surfaces (most plum fruits), but even in the most favourable circumstances the coverage of such surfaces is often poor. The 'hairy' type of surface (peaches) can be covered with a continuous film provided the spray is applied with sufficient force to penetrate between and wet the hairs.

Dieffenbach (E. M.). **Corrosion tests of metals and alloys in spray mixtures.**—*Agric. Engng, St Joseph, Mich.*, xviii, 7, pp. 301–302, 1 fig., 1 graph, 1937.

The writer's tests, carried out under conditions approximating as closely as possible to those of actual service, showed that aluminium, either 99 per cent. pure or containing 4 per cent. copper, is very resistant to the corrosive action of lime-sulphur solution (1 in 50) and completely so to that of Bordeaux mixture (3–4–50). Brass and bronze with a copper content up to 85 per cent. showed fair resistance to both preparations. Pure copper and copper alloys were entirely unaffected by Bordeaux mixture and an alloy consisting of 74 per cent. copper, 20 per cent. nickel, and 6 per cent. zinc was also resistant to lime-sulphur; the latter, however, damaged pure copper. Three samples of nickel and nickel alloys and 'stainless' iron and steel [*R.A.M.*, xvi, p. 397] containing 16 to 20 per cent. chromium and 7 to 10 per cent. nickel, or 12 to 18 per cent. chromium and no nickel, proved fully resistant to the action of both fungicides. A copper-bearing iron with a copper content of 0·15 per cent. or above was injured by lime-sulphur but not by Bordeaux mixture. Ordinary steel spray gun disks were not resistant to either preparation, pure tin was unaffected by Bordeaux mixture but damaged by lime-sulphur, while the reverse was the case with pure zinc.

Crosier (W.), Patrick (S.), & Taylor (L.). **Chemical treatments helpful in germination tests of seeds.**—*Phytopathology*, xxvii, 7, pp. 797–800, 1937.

Cereal seed-grain treated with ceresan, new improved ceresan, and sanoseed [*R.A.M.*, xv, pp. 286, 602] has been observed during the last five years at the New York (Geneva) Division of Seed Investigation to be consistently devoid of the common fungal growths due to *Alternaria* sp., *Fusarium* spp., *Helminthosporium* spp., and *Rhizopus nigricans* which are liable to complicate germination tests in untreated material. Similar satisfactory results were obtained by the application of one of these organic mercury compounds to pea, bean, and maize seed to prevent overgrowth by bacteria and profusely developing fungi. The standard treatment now in use in the writers' laboratory for seeds of the above-mentioned categories consists of a mixture of new improved ceresan and French talc (1 : 5), seeds and chemical being usually shaken up together in a stoppered flask or screw-top bottle [ibid., xvi, p. 444].

Herschler (A.). **Methoden zur Prüfung von Pflanzenschutz- und Vorratsschutzmitteln. XXXIV. Ein Schnellverfahren zur Feststellung des Kupfergehaltes von Spritzbrühen.** [Methods of testing plant protectives and food preservatives, XXXIV. A rapid process for the determination of the copper content of spray mixtures.]—*Nachr-Bl. dtsch. PflSchDienst*, xvii, 7, p. 54, 1937.

The following method is recommended for the determination of the copper content of Bordeaux mixture. Ten c.c. of the mixture is placed in a test tube and the precipitate dissolved by concentrated acetic acid; through a burette a 14·5 per cent. potassium ferrocyanide solution

is introduced in sufficient quantity to induce the precipitation of all the dissolved copper in an insoluble cupric ferrocyanide precipitate, on completion of which process a distinct Berlin blue reaction develops in the presence of a drop of ferric chloride. At this stage the percentage of copper sulphate in the mixture will correspond exactly with the number of c.c. of the potassium ferrocyanide solution.

KRAUSHAAR. **Elektro-Gebläse zum Betrieb des Sulfurators.** [Electro-bellows for the operation of the sulfurator.]—*Blumen -u. PflBau ver. Gartenwelt*, xli, 27, p. 308, 1 fig., 1937.

A simple and convenient electric bellows has been devised in a German rose nursery for attachment to the sulfurator apparatus [*R.A.M.*, xv, p. 298], the necessary heat for the working of which is generated in a few minutes with the expenditure of a negligible amount of current. The systematic and uniform application of sulphur by this method is stated to reduce rose rust [*Phragmidium mucronatum*: ibid., xv, p. 801; xvi, pp. 18, 776] to a minimum, both under glass and in the open.

HUS (P.). **Keuring van tuinbouwzaden.** [Selection of horticultural seed.]—*Tijdschr. PlZiekt.*, xliii, 7, pp. 155–167, 1937.

The writer briefly explains the urgent necessity of seed selection to ensure healthy horticultural stands, outlines the events leading to the amalgamation of a number of independent seed-testing establishments with the Dutch General Selection Service, and enumerates some well-known seed-borne diseases, with observations on their etiology, symptoms, and control, against which attention is directed.

GARDNER (H. A.), CORNTHWAITE (C. R.), & HART (L. P.). **Mildew prevention.**—*Circ. nat. Paint Varn. Lacq. Ass. inc., Sci. Sect.*, 526, pp. 46–57, 1937. [Abs. in *Rev. curr. Lit. Paint Col. Varn., 1937*, 56, p. 134, 1937.]

Mercuric chloride was found to be the most effective fungicide for incorporation in paints to prevent mildew and fungal growths [*R.A.M.*, xvi, p. 398]. Non-toxic compounds efficacious for the same purpose were sodium silicofluoride (1:300), anhydrous phthalate (1:150), and copper oxide (1:300), together with certain proprietary materials.

EDSON (H. A.) & WOOD (JESSIE I). **Crop losses from plant diseases in the United States in 1936.**—*Plant Dis. Reptr, Suppl.* 100, pp. 47–79, 1937. [Mimeographed.]

The estimates here presented in tabular form of the losses caused to cereal, vegetable, fruit, and miscellaneous crops by fungal, bacterial, virus, and physiological diseases in the United States during 1936 have been compiled on the usual lines [*R.A.M.*, xvi, p. 198].

GARBOWSKI (L.). **Postępy badań nad chorobami wirusowymi roślin.** [Progress attained in the investigation of virus diseases of plants.] —*Prace Wydz. Chor. Szkodn. Rośl. państw. Inst. nauk. Gosp. wiejsk. Bydgoszczy*, 16, pp. 127–173, 1937.

In this paper the author presents a comprehensive survey of recent

attainments in the investigation of virus diseases of potatoes, tobacco, tomato, bean, cucurbits, onion, and other plants. A separate section is devoted to the work done in regard to the physical, chemical, and immunological reactions of the various viruses. The bibliography appended comprises 61 titles.

Young (H. E.). **Rhizopogon luteolus, a mycorrhizal fungus of Pinus.**—*Forestry*, xi, 1, pp. 30–31, 1 pl., 1937.

The author states that in the experiments briefly described in this paper, mycorrhiza were quickly formed when the roots of sterile seedlings of *Pinus caribaea* and *P. taeda* growing in sterile white sand (2 parts), loam (1 part), and leaf mould (1 part), were inoculated with pure cultures of *Rhizopogon luteolus* [*R.A.M.*, xv, p. 683], fruit bodies of which were found, together with those of *Boletus granulatus* [ibid., xv, p. 596], growing under the same trees of the two *Pinus* species in Queensland. The mycorrhiza spread over the roots from the points of inoculation, and hypogeal sporophores were produced in regions of actively spreading hyphae, but none from the mature brown mycorrhiza; in one instance a sporophore developed on the soil surface, thus completing the full life-cycle of the organism. The fructification lasted on an average five days before breaking down to a slimy, viscid mass. It is considered possible that earthworms and beetle larvae may help in the spread of the spores of *R. luteolus* through the soil.

Medvedeva (Mme S.). **The toxins of Fusarium buharicum Jacz. and Fusarium graminearum Schw.**—*C. R. Acad. Sci. U.R.S.S.*, N.S., xv, 8, pp. 503–508, 1937.

The author states that chemical analysis showed that nutrient solutions in which *Fusarium buharicum* and *F. graminearum* [*Gibberella saubinetii*: *R.A.M.*, xv, p. 457; xvi, p. 31] had been separately cultured for two months contained, respectively, 21·74 and 19·73 mgm. ammonia and 8·9 and 8·4 mgm. urea per 100 c.c. of the filtered solution, but neither aldehydes nor organic acids. Further tests [the results of which are tabulated] showed that the wilting effect of the filtered culture solutions on tomato leaves was not affected by boiling, and hence cannot be due to the action of an enzyme. The permeability of the protoplasm of pieces of potato tubers was greatly increased by immersion in the unboiled medium of *G. saubinetii* cultures, while that in the boiled medium remained unchanged. These findings are considered to support Richter's view [ibid., xv, p. 388] that the toxic principle of the culture solutions is thermostable, a hypothesis confirmed also by Elpidina [loc. cit.], who has shown the active agent to be ammonia.

Dennis (R. W. G.). **The relation of boron to plant growth.**—*Sci. Progr.*, xxxii, 125, pp. 58–69, 1937.

After briefly reviewing and tabulating the recorded symptoms of boron deficiency in the higher plants, the author summarizes the evidence supporting the view that boron is an essential element in the nutrition of vascular plants, surveys the work done on the function of the element in the plant, notes the different sources of the substance, and discusses how a state of boron deficiency in the soil may be brought

about. The diseases for which boron applications have been recommended are listed and there is a bibliography of 56 titles.

Birkinshaw (J. H.). **Biochemistry of the lower fungi.**—*Biol. Rev.*, xii, 3, pp. 357–392, 1937.

Recent developments in the study of the biochemistry of the lower fungi are reviewed in considerable detail under the following headings: inorganic constituents of the medium, nitrogen metabolism, sources of carbon, respiration and energy exchange, growth factors, metabolic products, and enzymes [cf. *R.A.M.*, xv, p. 170 *et passim*].

Jones (L. K.) & Vincent (C. L.). **The susceptibility of Potatoes to the veinbanding virus.**—*J. agric. Res.*, lv, 1, pp. 69–79, 5 figs., 1937.

The results of the investigations discussed in this paper showed that the potato veinbanding virus [*R.A.M.*, xv, p. 738; xvi, p. 703], tentatively classified as potato virus 20 in 'Illustration of proposed system of nomenclature for plant viruses' (mimeographed) submitted in 1936 to the International Committee on description and nomenclature of plant viruses [ibid., xvi, p. 482], spreads very rapidly in the field in the vicinity of Pullman, Washington, as indicated by the fact that the progeny of a single virus-free Early Rose tuber exhibited 100 per cent. infection with the veinbanding virus in the second year of its cultivation in the field in that neighbourhood. Further tests with seedlings developed from crossing and selfing eleven [named] potato varieties and their seedling progenies showed that Katahdin alone transmitted to its progeny resistance to infection with the veinbanding virus. Seedling clones varied markedly from one another in expression of symptoms, from little or no mottling to moderate or strong mottling of the foliage, as well as various degrees of stem and leaf necrosis, but within a given clone the symptoms were uniform. The varieties Chippewa, Green Mountain, and Russet Burbank also showed some resistance to veinbanding, whereas Bliss Triumph, Early Rose, Gold Coin, Irish Cobbler, and Warba were very susceptible. Virus-free Chippewa, Katahdin, and Warba showed dwarfing and extreme necrosis when infected by the veinbanding virus.

Opitz (K.). **Versuche über den Abbau der Kartoffel auf den Versuchsfeldern Dahlem und Bornim. Versuchsperiode 1933 bis 1936.** [Experiments on Potato degeneration in the Dahlem and Bornim trial fields. Experimental period 1933 to 1936.]—*Landw. Jb.*, lxxxiv, 4, pp. 545–579, 2 graphs, 1937.

The results of the parallel series of experiments on potato degeneration at Berlin-Dahlem and Bornim during the 1933–6 period are fully discussed and tabulated [*R.A.M.*, xvi, p. 52].

Evidence of varietal differences in reaction to degenerative influences was obtained, Feuergold being resistant, Ackersegen and Konsuragis moderately so, Industrie, Rotweissragis, Voran, and Stärkereiche [Starchy] only slightly resistant, and Goldwährung very susceptible. No appreciable or consistent effect on degeneration was exerted by planting at different dates within the customary practical limits, and the beneficial influence of late sowing is attributed to the restricted opportunities

for virus transmission in the resultant stands. In connexion with the radius of infectivity of the virus (almost exclusively streak or Y mosaic [ibid., xvi, p. 771] in these trials), a marked decline of virulence was observed to coincide with the intervals (60–120–180 cm.) between one row of potatoes and the next; in consequence of the prevailing westerly and easterly winds the north and south direction of the test plots appears to promote infection.

Notwithstanding irrefutable evidence as to the decisive rôle of viruses in the etiology of degeneration [ibid., xvi, pp. 401, 486] the writer is satisfied that ecological factors are also of great importance and deserve equal consideration.

KAUSCHE (G. A.). **Über einige Beziehungen zwischen Viruskonzentration und Infektionseffekt bei Viren aus der X-Gruppe der Kartoffelmosaikviren.** [On some correlations between virus concentration and infective action in viruses of the X group of the Potato mosaic viruses.]—*Biol. Zbl.*, lvii, 7–8, pp. 402–431, 3 figs., 4 graphs, 1937.

Particulars are given of a series of experiments to determine the possible effect on the success of infection and course of the disease induced in Samson-Bashi-Bagli tobacco plants by inoculation with E. Köhler's virus mixture H19s+Cs35, highly virulent variants of H19 and C (tortoise-shell) potato mosaic (X group), respectively [*R.A.M.*, xvi, p. 704].

Positive results were given by inoculation with dilutions of the mixture down to 1:327,680, but the symptoms in such cases were abnormal. The extreme alkalinity (P_H 8·8) resulting from the dilution of the expressed juice did not modify the virulence of the virus mixture. In filtration and adsorption experiments with animal charcoal, a glacial acetic acid collodion filter, kaolin, and diatomaceous earth, the total virus content was considerably weakened without any corresponding injury to either of the two components in the form either of elimination or alteration in their respective proportions. Increasing reductions in the virus concentration lead to a decline in the incidence, and ultimately to the disappearance of primary symptoms, which are replaced by secondary manifestations, and at the minimal doses by the final phases of the disease. No strictly quantitative relation between the number of individual lesions and virus concentration could be traced [ibid., xiv, p. 601].

ZIMMERMANN (SARA). **Il metodo delle lastrine di rame per la diagnosi della degenerazione delle Patate (Ricerche sperimentali). Nota I.** [The copper strip method for the diagnosis of Potato degeneration (experimental researches). Note I.]—*Riv. Pat. veg.*, xxvii, 5–6, pp. 161–187, 5 figs., 6 graphs, 1937.

In this investigation on the diagnosis of potato degeneration by the copper strip method [*R.A.M.*, xvi, p. 553] the author estimates the degree of vigour of the tubers by classifying them according to the width of the discoloured zone as 0, +, ++, +++, multiplying the number of crosses by the number of tubers so affected, dividing the number of crosses thus obtained by the number of tubers, and multiplying by 100. It was found that different values for degree of vigour

were obtained when potatoes of the same variety and place of origin were tested on consecutive days, and the type of discoloration was apparently specific for each variety. Tubers from northern countries grown in hot ones showed approximately the same vigour (by these tests) as in their country of origin and the vigour for any given variety from one and the same locality varied with the length of storage before testing. The width of the discoloured area was found to depend on whether or not the tubers had begun to sprout, and both diseased and healthy tubers tested while still growing gave a vigour-index value of zero.

GARBOWSKI (L.). **Proby przeszczepienia chorób wirusowych Ziemniaków.** [Experiments on the transmission of Potato virus diseases.] —*Prace Wydz. Chor. Szkodn. Rośl. państw. Inst. nauk. Gosp. wiejsk. Bydgoszczy*, 16, pp. 5–39, 21 pl. [2 col.], 1937. [French summary.]

A detailed account is given of Polish experiments in the transmission of certain virus diseases of the potato from one variety to another by tuber core grafting, sap inoculation, or grafting, and from potatoes to other Solanaceae by the two last-named methods. When tuber cores of the Favorit variety, affected with either 'crinkle' or 'streak', or both, were grafted on apparently healthy Preussen tubers, the plants raised from the latter developed acute acronecrosis, [*R.A.M.*, xvi, p. 707], a mild form of which was also produced in the variety by grafting the tubers with cores from apparently healthy Favorit plants. Mild acronecrosis was further caused in plants from apparently healthy Alma and Topaz tubers, grafted with cores from Favorit tubers infected with crinkle. When transferred by the same means, streak mosaic [ibid., xvi, p. 486] from Preussen caused symptoms of mild infection in Favorit, Parnassia, and Topaz. Crinkle from Topaz also gave symptoms of mild infection on Parnassia and Alma, but failed to infect Favorit and Preussen. Of all the other Solanaceous plants that were tested *Hyoscyamus niger* was the most susceptible to infection either by sap inoculation or grafting, but potato stem grafts took and grew best on *Datura stramonium*. Inoculations into Virginia and White Burley tobacco or *H. niger* with juices from Minister v. Miquel, Favorit, Topaz, and Ursus plants affected with various types of crinkle produced symptoms, the severity of which was in direct relation to the severity of the disease on their original hosts. Aucuba or yellow mosaic from the variety Juli failed to produce symptoms on any of the other plants tested. When grown in the greenhouse Parnassia plants developed a condition, chiefly characterized by a partial drying up of the leaf veins, and sap inoculations from these plants into *H. niger* or *D. stramonium* produced symptoms typical of a virus infection. Attempts to transmit the diseases from potatoes to tomatoes, *Solanum nigrum*, *S. dulcamara*, *Petunia* sp., as well as to the potato varieties Parnassia, Gloriosa, Wohltmann, Kmieć, and Tytan, for the most part gave negative results.

GARBOWSKI (L.). **Wpływ gleby na rozwój mozaiki smugowatej w doświadczeniu z odmianą Ziemniaków Industria Modrowa.** [Influence of soil on the development of streak mosaic in tests with the Potato variety Modrow's Industrie.]—*Prace Wydz. Chor. Szkodn. Rośl.*

państw. Inst. nauk. Gosp. Wiejsk. Bydgoszczy, 16, pp. 41–69, 4 graphs, 1937. [French summary.]

This is an expanded version of the author's recent report of his investigations on the influence of the soil on the development of streak mosaic in the Modrow's Industrie potato, a full summary of which has already been published in this *Review* [*R.A.M.*, xvi, p. 486].

Orton (C. R.) & Hill (L. M.). **An undescribed Potato disease in West Virginia.**—*J. agric. Res.*, lv, 2, pp. 153–157, 6 pl. 1937.

An account is given of a disease, of unknown origin and etiology, which was first observed in 1931 on a few scattered potato plants in Preston County, West Virginia, but has since spread steadily until at present it is a limiting factor in potato production in certain districts of that State; it has also been observed in Pennsylvania and Maryland. The first external symptoms consist of a dwarfing, paling, and upward folding of the terminal leaflets, with a purplish discoloration of the margins of the younger leaflets in the Rural potato varieties. Wilting follows rapidly and axillary shoots are sent out but are short-lived; death of the vines usually ensues seven to ten days later. The roots of affected plants have a dull colour, are reduced in size and length, and break easily on pulling. Early infection results in the production of only a few, if any, tubers of marketable size, normal yields being secured only when the plants become infected at about the time of maturity. The vascular region of the stems, stolons, roots, and numerous regions in the stem pith turn brown and a discontinuous, dendritic necrosis is characteristic of the stem end of the tubers. The young terminal leaflets of diseased plants remain stunted, and show a lateral crowding together of the palisade and mesophyll, together with the suppression of intercellular spaces. The chloroplasts are depleted, and lose their starch grains and vacuoles; their membranes disintegrate and diffuse throughout the cell; the nuclei retain their normal shape but stain heavily with safranin. Phloem necrosis of the stem is one of the early microscopic symptoms of the disease and appears first in the basal region. The adjacent parenchyma also becomes necrotic and, to a lesser extent, the xylem and fundamental tissue, the necrotic areas sometimes showing lysigenous cavities. Before the onset of necrosis the starch grains in the storage cells of the tuber migrate towards the nuclei, and undergo gradual dissolution leaving behind hyaline spheres which form a stringy, often granular mass.

Moore (W. D.). **The relation of rainfall to the development of late blight of Irish Potatoes in the coastal section of South Carolina.**—*Circ. S.C. agric. Exp. Sta.* 57, 8 pp., 1937. [Abs. in *Exp. Sta. Rec.*, lxxvii, 3, p. 350, 1937.]

Potato late blight (*Phytophthora infestans*) is reported to have occurred only five times during the last twenty years in the coastal region of South Carolina. The development of infection does not appear to be materially affected by mean temperature and relative humidity [cf. *R.A.M.*, xv, pp. 45, 555; xvi, p. 629], but seems to bear some relation to the amount and distribution of rainfall during the growing season.

From the rainfall data obtained during the early part of any growing season it is stated to be possible to predict the time and frequency of spray or dust applications against the disease.

Leszczenko (P.). **Badanie odporności Ziemniaków na raka Ziemniaczanego.** [Potato tests for resistance to Potato wart disease.]—*Prace Wydz. Chor. Szkodn. Rośl. państw. Inst. nauk. Gosp. wiejsk. Bydgoszczy*, 16, pp. 71–81, 1937. [French summary.]

A tabulated account is given of further tests of potato varieties for resistance to wart disease (*Synchytrium endobioticum*) [*R.A.M.*, xvi, p. 119], the results of which showed that the following Polish varieties were immune from the disease, namely: Christiansen, Obra, Apolia, Gloria, Mazur, Przebój, Polonia, Odyniec, Rogalki sałatowe, Aal, Sobieszyńskie późne, Stefania z Sobieszyna, Pallas, Perkun, Friso, and Fram. Twenty-two foreign varieties are also listed as resistant.

Jones (W.) & MacLeod (H. S.). **Armillaria dry rot of Potato tubers in British Columbia.**—*Amer. Potato J.*, xiv, 7, pp. 215–217, 1 fig., 1937.

The dry rot of potato tubers caused by *Armillaria mellea* [*R.A.M.*, ix, p. 331; xiii, pp. 257, 552] was first observed in British Columbia in 1934 on the Netted Gem, Burbank, and Green Mountain varieties. The diseased tubers show hard, brown, roughened, shrunken, corky areas of varying extent, usually shallow but occasionally (in Green Mountains) penetrating to the medulla. Dark brown to black rhizomorphs are generally attached to the affected areas and may be found adhering to the skin at various points. The diseased internal tissues are light brown and interspersed with convoluted, white, brown-edged mycelial plates. Infected tubers are an almost total loss, but so far the incidence of the disease is inconsiderable.

Ruschmann (G.). **Hofmist und Edelmistwirkungen.** [Farmyard and fermented manure effects.]—*Landw. Jb.*, lxxxiv, 2, pp. 263–278, 4 figs., 1937.

In a comparative three-year fertilizing experiment at Landsberg-an-der-Warthe, a heavy incidence of potato blackleg (*Bacillus phytophthorus*) [*Erwinia phytophthora*: *R.A.M.*, xvi, p. 708] was induced, especially in sandy soils, by applications of farmyard manure at the rate of 35,800 kg. per hect., whereas fermented manure (30,000 kg. per hect.) caused little or no disease, and infection was also negligible on the control plots and on those treated with synthetic fertilizers. Four months after the application of the manures, the farmyard plots contained very much greater numbers of micro-organisms, especially putrefactive bacteria, than those receiving the fermented product, and a correlation between the presence of these entities in the soil and the occurrence of blackleg is strongly indicated.

Lepik (E.). **Eine durch Sclerotinia sclerotiorum verursachte Kartoffelinnenfäule.** [An internal rot of the Potato caused by *Sclerotinia sclerotiorum*.]—*Phytopath. Z.*, x, 2, p. 234, 1 fig., 1937.

Hero potatoes in Estonia were attacked during the persistently hot

and dry summer of 1936 by *Sclerotinia sclerotiorum* [*R.A.M.*, xv, p. 781], the agent of a hollow internal rot with no external symptoms. Sclerotia of the fungus developed profusely in December and January. The diseased tissues bore numerous conidiophores and masses of conidia of *Botrytis cinerea*, and *Phytophthora infestans* was also present in abundance in the epidermal layer of the affected tubers but apparently played no appreciable part in the causation of the rot.

Sarejanni (J. A.). **La pourriture du collet des Solanées cultivées et la classification du genre Phytophthora.** [Collar rot of cultivated Solanaceae and the classification of the genus *Phytophthora*.]—*Ann. Inst. phytopath. Benaki, Greece*, ii, 1, pp. 35–52, 1936 [issued 1937].

Collar rot of potato, tobacco, tomato, and chillies [*Capsicum annuum*] caused by species of *Phytophthora* and taking the form of sudden wilt or 'apoplexy' is among the most serious diseases of cultivated crops in Greece. Infection is favoured by the heavy watering necessary under local conditions in summer, and requires, at least for the first three hosts, a prevailing temperature of over 28° C. before it becomes epidemic.

The fungi causing the condition on the hosts mentioned have papillate sporangia measuring, respectively, 39 to 55 by 32 to 45, 22 to 50 by 19 to 34, 22 to 60 by 29 to 46, and 44 to 68 by 32 to 52 μ. The chlamydospores of the first three organisms measure 18 to 30, 19 to 30, and 16 to 60 μ in diameter, respectively, no chlamydospores being found for the chilli organism, which has amphigynous antheridia, and oogonia 20 to 32 μ in diameter. From these measurements the first three organisms would appear to be identical with *P. parasitica*, and the fourth with *P. capsici* [*R.A.M.*, xiv, p. 222; xvi, p. 159]. In this connexion the author critically discusses Leonian's work on the classification of *Phytophthora* [ibid., v, p. 4 *et passim*].

The potato collar rot may destroy over 80 per cent. of the crop in a few days. Infection begins at flowering time, about the beginning of September, if the prevailing temperature is high enough, and becomes arrested if it falls below 25°. The disease is confined to the vicinity of Thebes and Athens, and appears to have been recently introduced from Cyprus. Control consists in using only healthy seed, digging out the affected plants, earthing up, deepening the irrigation channels, and adding copper sulphate to the water.

P. capsici is prevalent throughout Macedonia, where it was first observed in 1933 and where already 70 per cent. of the chilli crop is sometimes affected. Usually the whole plant withers; occasional attacks have been noted on the fruits and in seed-beds.

The tomato disease occurs sporadically near Athens. It causes no important losses except in seed-beds.

Dastur (J. F.). **'Pan-sukh' disease of Rice in the Central Provinces.**—*Agric. Live-Stk India*, vii, 4, pp. 509–511, 1 pl., 1937.

In 1936, Gurmatia rice growing in Nagpur Division, Central Provinces, India, became affected by a physiological disease known as 'pan-sukh', observed some years before on the same variety, Bhata Gurmatia, and, to a less extent, on Lachai rice, in Chhatisgarh. The first symptom is a

drying up of the outer leaves, and if the affected plants are very young there is very little tillering; only a very few, much attenuated leaves are produced, and these scarcely come to a head. If heads are developed, they are light and may not completely emerge from the sheath. The flowers are sterile, but the glumes are of normal shade and colour. When fully grown plants are affected, tillering is practically normal, but the outer leaves dry up prematurely and the heads are light, occasionally failing to emerge completely. The root system is abnormal, showing dead and unbranched coarse roots or water roots, absence of root hairs, and few secondary fine roots.

The disease was experimentally reproduced by allowing field water to stand, whereas in affected fields that were promptly drained and allowed to dry before being watered again the plants recovered. If the disease occurs late in the season soil application of ammonium sulphate (30 to 50 lb. per acre) arrests its progress and permits the plants to head normally.

The disease is distinct from the destructive 'straighthead' disease reported from the United States, with which a condition of rice from the Central Provinces was thought by Shaw to be identical [*R.A.M.*, ii, p. 31].

KALINENKO (V. O.). **Immunity shifts in Kok-saghyz in vitro.**—*Phytopath. Z.*, x, 3, pp. 332–337, 5 figs., 1937.

The latex of *Taraxacum kok-saghyz* is considered to play an important part in the resistance of the plant to disease. This was exemplified in an experiment with 2,000 'plantation roots' from which the leaves were removed before planting in the greenhouse, whereupon regeneration of the leaves diminished the latex in the roots very considerably, with the result that the plants became severely rotted. When the *Fusarium* causing wilt of *T. kok-saghyz* [*R.A.M.*, xvi, p. 406] was cultured on root portions of the host, those from susceptible plants were overcome by the fungus in one or two days and reduced to a slimy mass, whereas those from resistant plants permitted only a very slight development of the organism. The effect of ether on the root pieces was to increase the resistance, whereas exposure to chloroform intensified susceptibility to a marked degree. Heating to 45° C. for 30 minutes destroyed resistance completely, and at this temperature the latex is transformed into threads of rubber. These results are considered to indicate that a detailed study of the latex in relation to disease resistance in *T. kok-saghyz* is required.

SKINNER (C. E.) & DRAVIS (FAITH). **A quantitative determination of chitin-destroying micro-organisms in soil.**—*Ecology*, xviii, 3, pp. 391–397, 1937.

The authors state that by means of the dilution method and using selective inorganic liquid media, to which a strip of chitin was added so that it was partly submerged, they counted a large number of chitin-destroying micro-organisms in 26 soils, ranging from 288 in a dry sand from the banks of the Mississippi river to over 1,000,000 per gm. of soil in a fertile cultivated loam and garden soils. Most of these organisms were true bacteria, less than half were actinomycetes, and only a few

were moulds, including two strains of *Aspergillus*, six of *Mucor*, two of *Penicillium*, one of *Absidia*, four of *Trichoderma*, one of *Fusarium*, and two each of *Gliocladium* and *Thamnidium*. While both the actinomycetes and the moulds destroyed chitin more slowly than the bacteria, among the moulds the Phycomycetes dissolved it particularly rapidly, in contrast to their well-known lack of cellulose-dissolving power; this behaviour may possibly be related to the fact that the fungi parasitic on other fungi and many of those parasitic on insects are Phycomycetes.

Park (M.). **The seed treatment of Ginger.**—*Trop. Agriculturist*, lxxxix, 1, pp. 3–7, 1937.

In 1934, seed ginger stored at Peradeniya, Ceylon, and found to be superficially infected with *Sclerotium rolfsii* but otherwise apparently sound, was treated by immersion in a 1 in 1,200 solution of mercuric chloride for 1½ hours, (*a*) two months, (*b*) three days before planting. These treatments gave, respectively, 686 and 728 plants, as compared with 470 in the untreated controls, 6¼ lb. of seed being used in each lot.

Salmon (E. S.) & Ware (W. M.). **The downy mildew of the Hop in 1936.**—*J. S.-E. agric. Coll., Wye*, xl, pp. 27–36, 2 figs., 1937.

In this account of the hop downy mildew [*Pseudoperonospora humuli*: *R.A.M.*, xv, p. 824 and next abstract] situation in England in 1936, the authors state that although wet weather favoured infection during July and the early part of August, the three routine applications of home-made Bordeaux mixture (10–15–100) [ibid., x, p. 406] in most cases gave a perfectly healthy crop, as the first treatment was applied before the rains set in. Growers who had delayed spraying applied Bordeaux mixture to the cones, but this practice should cease, as the sprayed cones contain an objectionable amount of copper. The total rainfall for August was 0·99 in. below normal and the improvement is considered to have prevented a major disaster to the crop. During the wet weather in July lateral spikes developed in large numbers towards the top of the bine and their removal was found to be easily effected by a single movement of a sharp knife fastened to the end of a long, light pole. In future, in order to safeguard the crop in very wet weather, spraying should be effected (1) when most of the bines have reached the top wire, (2) when the 'pin' just begins to show, (3) when the burr begins to appear, and (4) immediately the burr has disappeared. Cotton-seed oil Bordeaux emulsion (5 lb. copper sulphate, 7½ lb. hydrated lime, 6 pints edible cotton-seed oil, and 100 galls. water) is recommended for the first three applications, the advantages attaching to this preparation being that heavy applications can be made without fear of injury to the hops, and that nicotine can safely be added to it.

Marked resistance to infection was shown by some of the New Varieties of hops raised at Wye, including Fillpocket (Z 62) and Early Promise (X 35).

Salmon (E. S.). **'Early Promise', a new variety of Hop.**—*J. S.-E. agric. Coll., Wye*, xl, pp. 37–43, 2 figs., 1 graph, 1937.

A full description is given of the hop X 35, which is placed on the market under the name Early Promise. It is liable to only slight attacks

of downy mildew [*Pseudoperonospora humuli*: see preceding abstract] on the bine, and is resistant on the burr and cones. It is capable of carrying mosaic [*R.A.M.*, xv, pp. 424, 605] without showing symptoms, and appears to be immune from nettlehead [ibid., xvi, p. 367].

HAMPP (H.). & JEHL (J.). **Zwei neue Methoden zur Prüfung der pilztötenden Wirkung der Hopfenperonospora-Bekämpfungsmittel.** [Two new methods of testing the fungicidal action of the Hop *Peronospora* control preparations.]—*Phytopath. Z.*, x, 2, pp. 223–229, 1937.

Two laboratory methods are described for testing the fungicidal action of preparations for the control of hop *Peronospora* [*Pseudoperonospora humuli*: *R.A.M.*, xvi, p. 773]. Conidia from severely infected young seedlings in the greenhouse were washed off with rain water and placed in a dish in the laboratory at 18° C., with the result that zoospores were produced in two hours. Leaves taken from plants in experimental plots sprayed with ten different fungicides were transferred to Petri dishes on damp filter paper in the laboratory, and drops of the zoospore suspension placed upon them. The examination of the suspension on a slide after 30, 45, and 60 minutes revealed marked differences in the toxicity of the fungicides to the zoospores, as gauged by the motility of the latter. The resistance of the fungicides to washing off by rain was estimated from determinations made after heavy rains. The relative efficacy of the ten preparations [which are designated only by numbers] is shown in tabular form.

Young shoots of the highly susceptible Hallertau variety were placed in wooden frames in sand with a subsoil of compost in a cold greenhouse at 60 to 80 per cent. relative humidity on 25th May, sprayed with the ten above-mentioned fungicides on 25th and 30th May, 5th, 13th, 20th, and 27th June, and 6th and 15th July, and artificially inoculated with a zoospore suspension of the fungus on 30th June and 1st and 2nd July. On 10th July the plants were transferred to the open, and outbreaks of downy mildew were observed on the 10th, 13th, and 17th. The efficacy of the preparations was rated according to the usual conventional scales.

[This article is reprinted in *Mitt. biol. Anst.* (*Reichsanst.*) *Berl.*, 55, pp. 55–60, 1937.]

GÖPP (K.), CHRIST (R.), & REICH (R.). **Occurrence of micro-organisms in Hops of various qualities.**—*Tagesztg Brau.*, xxxv, pp. 495–496, 1937. [Abs. in *J. Inst. Brew.*, N.S., xxxiv, 10, p. 432, 1937.]

Following up the work of A. H. Burgess [*R.A.M.*, xv, p. 315], the writers tested six samples of hops [? in Germany], of which two were normal while the remainder showed more or less extensive mould growth accompanied by a noticeable impairment of aroma. Among the organisms isolated from the diseased material were *Rhizopus nigricans*, *Penicillium glaucum*, *P. brevicaule* [*Scopulariopsis brevicaulis*], *Aspergillus glaucus*, *Citromyces pfefferianus*, *Cladosporium herbarum*, and a species of *Dematium*. From the results of a series of experiments involving the addition of the infected hop extracts to sterile beer prior to fermentation, the deleterious effects of the moulds in question would

appear to be inconsiderable, being largely nullified by the brewing operations and the simultaneous presence of other micro-organisms.

Salgues (R.). **Les modifications biochimiques en phytopathologie.** [Biochemical modifications in phytopathology.]—*Rev. gén. Sci. pur. appl.*, xlviii, 9, pp. 237–244, 1937.

The writer tabulates and discusses the results of his comparative biochemical analyses of healthy plants and those infected by fungal diseases, some of which have appeared from time to time in this *Review*. *Colchicum autumnale* bulbs attacked by *Urocystis* [*Tuburcinia*] *colchici* [*R.A.M.*, xvi, p. 777] contained only 0·044 per cent. colchicin as against 0·115 in those of healthy plants. *Peronospora hyoscyami* [ibid., xvi, p. 65] caused a reduction in the total alkaloid content of *Hyoscyamus niger* from 0·208 to 0·054 per cent. The total menthol content of *Mentha piperita* leaves parasitized by *Phyllosticta menthae* was 37·2 per cent. compared with 44·0 in those of healthy plants. The carbohydrate content of Early Rose potato tubers infected by *Synchytrium endobioticum* amounted to only 15·30 per cent. as against 24·98 for sound ones. Comparable data are furnished for a number of other drug plants, fodders, meadow grasses, and miscellaneous plants.

Varadaraja Iyengar (A. V.). **Contributions to the study of spike disease of Sandal (Santalum album Linn.). Part XVII. Some factors relating to the abnormal accumulation of carbohydrates in diseased tissues.**—*J. Indian Inst. Sci.*, xx A, 1, pp. 1–14, 1937.

Spiked sandal (*Santalum album*) leaves [*R.A.M.*, xvi, p. 340] from Bangalore and other localities gave proof of higher diastatic activity than healthy ones at all temperatures tested (25° to 27°, 45° and 50° C.), as well as after the elimination of tannin by means of ethyl acetate. Though the total quantity of material extracted from spiked specimens is less than that from the controls, the actual tannin content of diseased foliage is more than twice that of healthy leaves. The extract from affected samples was further found to enhance the amylase activity of both sound and diseased detannized residues, while a similar extract from healthy material exerted a comparatively feeble stimulus. In spiked leaves the tannins were found to consist largely of the pyrogallol group, whereas those of healthy ones belonged principally to the pyrocatechin category. Pyrogallol accelerated amylase activity in both leaf types, whether detannized or not, but pyrocatechin tended to inhibit the diseased specimens more than the controls. The high diastatic activity of spiked leaves results in the synthesis of more starch from the sugars present therein. Although starch accumulation is noticeable from the inception of the disease, sugar concentration increases only in the advanced stages parallel with the decomposition of fatty substances. The total fat content of diseased leaves is appreciably lower and the free acidity of ether extracts higher than in the controls. Evidence is adduced to show that starch accumulation commences from below and is therefore due to defective translocation. Inability to assimilate calcium is the immediate reaction of the sandal stems and leaves to spike infection.

Sarejanni (J. A.). **Liste II des maladies des plantes cultivées et autres de la Grèce.** [List II of diseases of cultivated and other plants in Greece.]—*Ann. Inst. phytopath. Benaki, Greece*, ii, 1, pp. 8–12, 1936 [issued 1937].

This second list of diseases of plants in Greece [*R.A.M.*, xv, p. 556] is based on material examined at the Benaki Phytopathological Institute during 1934–5.

Tschudy (R. H.). **Experimental morphology of some species of Chaetomium. I. Use of cultural reactions in determining species characteristics.**—*Amer. J. Bot.*, xxiv, 7, pp. 472–480, 15 figs., 1937.

From a study [details of which are given] of nine species of *Chaetomium* cultured for several generations on over 75 different nutrient media, the author concludes that cultural reactions of these fungi appear to be the best means of arriving at an accurate determination of their specific characteristics, and he believes that in this genus descriptions will have little value unless a definite substratum, e.g., malt-dextrose-starch is used for the growth of the species. As a result of his studies he describes the cultural behaviour of a number of species of *Chaetomium*, reduces *C. affine* to a variety, var. *affine*, of *C. globosum*, states that *C. subterraneum* [*R.A.M.*, ix, p. 58] is nothing but *C. globosum*, and erects two new species.

Hansford (C. G.). **Annotated host list of Uganda parasitic fungi and plant diseases. Part II. Part III.**—*E. Afr. agric. J.*, ii, 6, pp. 498–504; iii, 1, pp. 79–84, 1937.

These two further instalments of the author's list of parasitic fungi and plant diseases so far recorded in Uganda are on the same lines as the first [*R.A.M.*, xvi, p. 550], and include hosts belonging to 37 families.

Armillaria mellea is stated to cause the most important disease of tea in Uganda [ibid., viii, p. 202]. Cotton wilt (*Verticillium albo-atrum*) [ibid., xv, p. 150; xvi, p. 455] is now known from most cotton areas south of Lakes Albert and Kioga and is increasing every year. The fungus is distributed all over Uganda in seed obtained from diseased plants, and under present conditions dissemination by this means cannot be prevented. It is probable that *V. albo-atrum* is locally the chief cause of cotton wilt. The fungus was recently discovered attacking cassava at Bukalasa. *Mycosphaerella areola*, the ascigerous stage of *Cercosporella gossypii* (syn. *Ramularia areola*) [ibid., xiv, p. 629] was recorded in its ascigerous stage on cotton. *Gibberella fujikuroi*, a common saprophyte on dead cotton plants, causes a disease of cotton seedlings simulating sore shin. *Cladosporium album* [*Erostrotheca multiformis*: ibid., xvi, p. 322] is recorded on beans (*Phaseolus*) (on which it causes little damage) and peas.

Maneval (W. E.). **A list of Missouri fungi with special reference to plant pathogens and wood-destroying fungi.**—*Univ. Mo. Stud.*, xii, 3, pp. 1–150, 1937.

In continuation of the author's earlier compilation [*R.A.M.*, vi, p. 126], an alphabetical list is given of 1,191 Missouri fungi, including

chiefly plant pathogens and wood-destroying organisms, but mentioning also a few saprophytes and diseases of virus or physiological origin, based on a study of additions made to the Missouri herbarium since the publication of the earlier list and a careful perusal of the literature of the subject. The list is followed by a host index and a bibliography of 526 titles.

YARWOOD (C. E.). **Unreported powdery mildews.**—*Plant Dis. Reptr*, xxi, 10, pp. 180–182, 1 fig., 1937. [Mimeographed.]

A list is given of 31 hosts on which powdery mildews, believed to be new to the United States, were found in California since 1934. The fungi are grouped, in the absence of perithecia, according to their conidiophores, of which three types are distinguished, viz., the *Erysiphe polygoni* type, the *E. cichoracearum* type, and the *Podosphaera leucotricha* type. All specimens with conidiophores of *E. polygoni* type showed clear evidence of a diurnal cycle of conidial formation and division of the generative cell [*R.A.M.*, xvi, p. 627].

SYDOW (H.). **Novae fungorum species—XXV.** [New species of fungi—XXV.]—*Ann. mycol., Berl.*, xxxv, 3–4, pp. 244–286, 1937.

In this critically annotated list 42 new species and 4 new genera of fungi, with Latin and German diagnoses, are described from various parts of the world [*R.A.M.*, xvi, p. 342]. *Maravalia crotalariae* n.sp. formed a yellowish-white, mealy coating of uredosori on the stems and inflorescences of *Crotalaria usaramoensis* from Malaya, with spherical, subspherical, or very broadly ovate, echinulate-verruculose uredospores, 16 to 21 by 14 to 17 μ, with a hyaline membrane barely 1 μ in thickness; the teleutosori occur on the stems and on dry, brownish spots 0·5 to 1·5 mm. in diameter on the leaves and bear ellipsoid, oblong to ovate, or broadly fusiform, smooth teleutospores, 23 to 32 by 9 to 15 μ, with a hyaline membrane 0·5 to 0·7 μ in thickness, arising in groups from a hyaline hymenial cell, mostly 8 to 12 by 5 to 8 μ, forming a quadricellular promycelium 45 to 65 by 4·5 to 6 μ, and furnished with a hyaline pedicel, 15 to 30 by 2·5 to 4 μ.

PICBAUER (R.). **Fungi bulgarici a Dre F. Bubák lecti.** [Bulgarian fungi collected by Dr. F. Bubák.]—*Ann. mycol., Berl.*, xxxv, 2, pp. 138–148, 1937.

An annotated list is given of 65 fungi collected in Bulgaria by the late Dr. F. Bubák, including 31 new species, 3 new varieties, and one new name, for which Latin diagnoses are supplied. *Hypospila rhodopea* Bub. & Picb. n.sp. was found on *Prunus divaricata* twigs. *Phyllosticta trifoliiseda* n.sp. was collected on *Trifolium* (?) *medium* leaves, and a fungus doubtfully identified as *P. violae* [*R.A.M.*, xv, p. 468] with cylindrical, straight or curved, continuous, light brown conidia, 6 to 11 by 2 μ, on those of *Viola odorata*, producing circular, white spots 2 to 4 mm. in diameter. Ill-defined lesions with brown centres and purplish-pink margins on *Vaccinium uliginosum* were found to be due to *Septoria vaccinii uliginosi* n.sp. *Hendersonia alabakensis* n.sp. was responsible for round, dry spots with dark edges, 5 to 7 mm. in diameter, on elm (*Ulmus effusa*) leaves. Walnut (*Juglans regia*) leaves were infected by

Marssonina juglandis [*Gnomonia leptostyla*: ibid., xv, p. 330]. *Cercosporina bubakii* Picb. n.sp. formed circular to angular, brown, often confluent spots, 2 to 3 mm. in diameter, on both sides of *Ribes petraeum* leaves.

Sydow (H.), Mitter (J. H.), & Tandon (R. N.). **Fungi indici—III.** [Indian fungi—III.]—*Ann. mycol., Berl.*, xxxv, 3–4, pp. 222–243, 1937.

This copiously annotated list of 72 Indian fungi [*R.A.M.*, xiv, p. 470] contains 18 new species with diagnoses in Latin and German.

Tai (F. L.). **A list of fungi hitherto known from China. Parts II, III, and IV.**—*Sci. Rep. Tsing-Hua Univ.*, Ser. B, ii, 4–6, pp. 191–639, 1937.

Parts II, III, and IV of the writer's profusely annotated list of Chinese fungi [*R.A.M.*, xvi, p. 1], amplified in a number of cases by Latin or English diagnoses, consists of 676 Ascomycetes, 1,077 Basidiomycetes, and 753 Fungi Imperfecti. Host and fungus indexes are appended.

Fischer (E.). **Über einige von E. Gäumann in Java und Celebes gesammelte Ustilagineen und Uredineen.** [On some Ustilagineae and Uredineae collected by E. Gäumann in Java and Celebes.]—*Ber. schweiz. bot. Ges.*, xlvii, pp. 419–424, 1937.

This is a critically annotated list of two Ustilagineae and twelve Uredineae (the latter including three new species with Latin diagnoses) collected by E. Gäumann in Java and Celebes from 1919 to 1922. *Aecidium mori* was found on mulberry (*Morus indica*) [*R.A.M.*, xii, p. 396] leaves.

Bose (S. R.). **Polyporaceae from Lokra Hills (Assam).**—*Ann. mycol., Berl.*, xxxv, 2, pp. 119–137, 1937.

This is a fully annotated list of 73 Polyporaceae collected during 1933–4 by N. L. Bor in the Lokra Hills of Assam (5,000 to 10,000 ft. above sea-level), mostly on logs and fallen tree trunks, including certain rare species never encountered in the Bengal plains [*R.A.M.*, xv, p. 469] but common in the temperate climates of Europe and North America.

Koch (L. H.). **Bacterial diseases of Tobacco in Canada.**—*Lighter* (*Dep. Agric., Can.*), vii, 3, pp. 13–16, 1937. [Mimeographed.]

Angular leaf spot of tobacco (*Bacterium angulatum*) [*R.A.M.*, xvi, p. 637] occurs every year in Ontario and Quebec, usually being worse in the latter than in the former locality. In an epiphytotic in the Assomption district of Quebec in 1935 Parfum d'Italie was the variety most severely attacked, Petite Havane was highly susceptible, but the Belge variety was little affected and, unlike the other two, was resistant to physical injury.

Wildfire (*Bact. tabacum*) [loc. cit. and next abstract], first reported in Canada from Quebec in 1925, has since been recorded at different times from the same locality, north of Montreal, and Ottawa; it is thought that it may also have been present along the northern shore of Lake Erie.

Hollow stalk (*Bacillus* [*Erwinia*] *aroideae*) [ibid., xvi, pp. 658, 780] has occurred sporadically in Ontario and Quebec since the early days of tobacco-growing, but has only been a minor trouble. The identity of hollow stalk with the blackleg reported from Kentucky and attributed to the same organism [ibid., xi, p. 209] is not yet accepted by the author. In 1936, blackleg was widespread in Essex and Kent counties, Ontario, and was sometimes accompanied by damping-off due to *Rhizoctonia* and *Pythium* spp. [ibid., xvi, p. 637].

Control measures for the diseases are briefly indicated. [This paper is republished in *Plant Dis. Reptr*, xxi, 15, pp. 287–289, 1937.]

DUFRÉNOY (J.). **Modifications of cell structure in 'halo wildfire' and 'epidemic wildfire'.**—*Phytopathology*, xxvii, 7, pp. 792–796, 5 figs., 1937.

The examination of tobacco seedlings attacked by the 'halo' form of wildfire (*Bacterium tabacum*) [*R.A.M.*, xv, p. 537] in south-western France in 1931, 1932, 1936, and 1937 showed, as already pointed out by the writer, that the resultant pathological modifications depend on the relative humidity of the atmosphere and the relative intensity of sunlight [ibid., xii, p. 476]. When the sky was overcast and relative humidity ranged from 80 to 100 per cent. at the time of infection the affected cells retained their turgescence, though undergoing a loss of starch and sugars; the translocation of the former from the plastids was accompanied by the development of oil droplets that adsorbed the yellow carotin pigments. When the sky was clear and relative humidity below 80 per cent., the vacuolar solution became rich in phenolic compounds and tetrahedric crystals of calcium oxalate, while the hydrogen-ion concentration rose above P_H5. In 'halo' formation the bacteria are unable to invade and destroy rapidly the adjacent cells, giving the toxin time to diffuse out, whereas in 'epidemic' wildfire they quickly invade the tissues, owing to water-soaking, and involve the destruction of the adjacent areas. Tobacco leaves subjected to a strong water spray for two minutes develop water-soaked areas that may develop into 'experimental wildfire lesions' on inoculation with a suspension of *Bact. tabacum*. After a few hours of strong insolation the water-soaked infected tissue may dry out and darken into typical wildfire lesions.

Report of Committee of the Tobacco Research Council on the black-shank disease of Tobacco.—*Plant Dis. Reptr*, xxi, 13, pp. 246–248, 1937. [Mimeographed.]

This is a concise summary of the available information [much of which has already been presented here from other sources] concerning the distribution and importance, host range, environmental relations, modes of dissemination, and prevention or control of black shank of tobacco (*Phytophthora parasitica* var. *nicotianae*) [*R.A.M.*, xvi, p. 780] in the United States [ibid., xiv, p. 608]. In 1935 the disease was newly reported from two States, Tennessee and Kentucky. The only reliable method of control in the cigar-wrapper area of Florida and Georgia consists in the planting of resistant varieties, seed of which is obtainable from the North Florida Experiment Station, Quincy. In

North Carolina, four- to five-year rotations, interspersing small grains, clover or *Lespedeza*, and maize between the tobacco crops, are stated to have given almost complete control.

Spencer (E. L.). **Influence of host nutrition on systemic development of Tobacco mosaic.**—*Plant Physiol.*, xii, 3, pp. 825–832, 1937.

In continuation of his previous investigations [*R.A.M.*, xiv, pp. 474, 659], the author has studied the effect of mineral nutrition on the systemic spread of yellow tobacco mosaic (Johnson's virus No. 6) in tobacco plants in sand cultures, the time required for the virus to reach and produce symptoms on the tip leaves of inoculated plants being determined. The results showed that in tobacco plants supplied with nutrient solutions containing either a deficiency or an excess of nitrogen, symptoms of systemic infection on the apical leaves of inoculated plants appeared earlier than in plants that received a medium amount of nitrogen, sufficient to produce healthy, vigorous growth. The time at which treatment with excess nitrogen was started before inoculation did not appear to affect the results. The systemic infection symptoms developed earlier in plants that received no phosphorus, than in those treated with excess phosphorus, the retardation increasing progressively in plants treated with excess phosphorus for one, two, three, or four weeks prior to inoculation; the growth of the plants was also directly correlated with the duration of the excess phosphorus treatment. A similar correlation was also found between the time of appearance of the systemic symptoms and the duration of treatment with excess potassium, but excess potassium retarded the growth of the plants more than potassium deficiency. These results are considered to indicate that the development of yellow mosaic was accelerated by high nitrogen nutrition and retarded by either high phosphorus or high potassium nutrition. No correlation was apparent between the rapidity with which the systemic symptoms developed and the distance the virus had to travel to reach the growing tip.

Doolittle (S. P.) & Beecher (F. S.). **Seed transmission of Tomato mosaic following the planting of freshly extracted seed.**—*Phytopathology*, xxvii, 7, pp. 800–801, 1937.

Shortly after transplanting, 13 out of 257 plants, raised at the Arlington Experiment Station, Virginia, from seed sown immediately after extraction from tomato fruits harvested in the field in 1934, developed mosaic. Seed transmission of the disease being suspected, fresh lots of seed were extracted from greenhouse tomatoes affected by (*a*) ordinary mosaic (tobacco virus 1), and (*b*) streak caused by tobacco mosaic combined with potato virus X [*R.A.M.*, xvi, p. 571] and sown in pots under controlled conditions, one lot being previously washed and dried for a week and the other planted immediately. In the washed series, 6 plants out of 249 raised from mosaic seed and 4 out of 136 from the seed of streaked plants were stunted and bore twisted, filiform cotyledons, while in the untreated, identical symptoms were observed in 8 out of 257 plants in the mosaic lot and in 7 out of 104 in that of streaked origin. Subsequently this cotyledonary deformity developed into typical mosaic but at no time did any symptoms of

streak appear. The 523 controls raised from seed from mosaic-free tomatoes remained healthy. Out of 3,567 plants raised from seed from mosaic or streaked plants stored for 3 to 12 months before planting, none showed infection in the seedling stage but 19 contracted mosaic after the formation of four to six leaves, though here again streak was absent; the 937 controls remained healthy. While transmission by stored seed therefore is not definitely established, the practice of sowing tomato seed immediately after extraction in order to produce several generations of plants in close succession would appear, from these data, to entail considerable risk of mosaic transmission.

BALD (J. G.). **Investigations on 'spotted wilt' of Tomatoes. III. Infection in field plots.**—*Bull. Coun. sci. industr. Res. Aust.* 106, 32 pp., 4 graphs, 1 diag., 1937.

In this, the third paper of this series [*R.A.M.*, xi, p. 549], the author gives a detailed account of his study of the data accumulated from 1926 to 1934, inclusive, at the Waite Agricultural Institute on the infection of tomatoes with spotted wilt [cf. ibid., xvi, pp. 517, 571], and recorded in the form of field maps showing the position of each diseased plant and the date on which the symptoms were observed. The curve for infection rates, constructed for the whole period under review, showed a series of maxima probably representing the emergence of successive generations of adult thrips (*Thrips tabaci* and *Frankliniella insularis*) vectors of the virus. High daily rates of infection appeared to be related to high temperatures occurring twelve days earlier, and low rates to low temperatures, but there was a slight indication that current high temperatures depressed the infection rate. In a rapidly growing tomato plant the normal incubation period appeared to be twelve days, but was longer and more irregular in mature plants, and sometimes was shorter in very young vigorous plants. In summer weather all the plants within a radius of 10 to 15 yds. from an infection focus were equally liable to be infected, the likelihood of infection decreasing with increasing distance. Statistical studies [loc. cit.] showed that field transmission of the disease was almost entirely by insects. Irregularities in the distribution of diseased plants were associated with differences in varietal susceptibility, the presence of thrips on adjacent ornamentals, differences in methods of watering, and perhaps to local patchiness of the soil affecting the palatability of the plants to the vectors. Varietal differences in susceptibility, due to the internal resistance of plants to the multiplication and translocation of the virus, were smallest when the inoculated plants were very small and growing rapidly, and greatest when the plants were fruiting. The failure of spraying and dusting to control the disease is explicable in a large measure by the invasion of the treated plots by infective vectors from outside.

FOSTER (A. C.) & TATMAN (E. C.). **Environmental conditions influencing the development of Tomato pockets or puffs.**—*Science*, N.S., lxxxvi, 2218, pp. 21–22, 1937.

Tomatoes in the Atlantic and Gulf Coast States, California, and northern greenhouses are liable to serious damage from a disease known

as 'pockets' or 'puffs', the losses from which in the early spring crops of Texas commonly amount to 15 per cent. and may reach 65 per cent. Contributory factors to the development of the disorder were shown by intensive studies during the past five years to include non-fertilization of the ovules or typical parthenocarpy, associated with abnormalities of the reproductive organs, ovule or embryo abortion after normal fertilization, and necrosis of the vascular and placental tissue after the fruit is well developed, due to excessively high or low temperatures, soil saturation or supersaturation, low soil moisture, and other conditions impeding proper growth through disturbances in the metabolic and respiratory activities. There is some evidence that the incidence of 'pockets' may be reduced by plentiful applications of superphosphate and a sparing use of nitrogen.

[A more detailed account of this work is given by the authors under the same title in *Plant Physiol.*, xii, 3, pp. 875–880, 1937.]

Krausche (K. K.) & Gilbert (B. E.). **Increase of transpiration rates of Tomato leaves due to copper sprays.**—*Plant Physiol.*, xii, 3, pp. 853–860, 1937.

The results of greenhouse experiments briefly described in this paper, in agreement with those of Wilson and Runnels [*R.A.M.*, xii, p. 459; xvi, p. 714] and some other investigators, showed that spraying with Bordeaux or Burgundy mixtures increased the total transpiration of tomato plants for the 24-hour period from a low percentage to a maximum of 105, the greatest effect occurring at night, and that independently of whether the spray was applied to the upper, to the lower, or to both surfaces of the leaves. The greatest increase in transpiration was further shown to be effected by those sprays which were very likely to cause injury to the leaves. A series of direct observations of the effect of the sprays on the stomata, made with a Leitz ultrapak at three- to six-hour intervals for more than 24 hours, indicated that the general appearance of the stomata of tomato leaves sprayed with 8–8–50 Bordeaux mixture did not differ from that of the stomata of control leaves, except that some of the stomatal pores of the former seemed to be clogged or sealed by minute particles of dried spray material. Transpiration in the tomato must take place largely through the cuticle, and microchemical tests showed that the epidermis of the tomato plants used in the experiments was composed of undifferentiated cellulose, which is permeable. The authors suggest that the soluble copper and calcium on the leaf surface probably readily penetrate through the epidermis, and bring about changes in the permeability of the membranes of the guard and mesophyll cells, so that water loss takes place at varying rates.

Wollenweber (H. W.). **Zur Abwehr des Ulmensterbens.** [On the prevention of the dying-off of Elms.]—*Forsch. dtsch. Fortschr. Wiss.*, xiii, 20–21, pp. 251–252, 2 figs., 1937.

Following a brief explanatory account of the connexion between bark beetles [chiefly *Scolytus scolytus* and *S. multistriatus*] and the elm disease (*Ceratostomella*) [*ulmi*], the writer refers to the promising results of grafting experiments in Italy with *Ulmus pumila* and *U. pinnato-*

ramosa, and in Holland with the Spanish seedling *U. foliacea* No. 24 [*R.A.M.*, xvi, p. 643]. Grafting experiments at Dahlem, Berlin, with *U. pumila* and *U. pinnato-ramosa* on susceptible but healthy individuals of the species commonly used for street planting gave somewhat disappointing results, since the small-leaved and squarrose habit of the dwarf oriental varieties prevents the crowns from affording adequate shade. It has been shown, however, that *C. ulmi* is incapable of infecting either the immune scion or the susceptible stock of such grafts, presumably owing to the avoidance of healthy wood and abundant sap by the bark beetles, which prefer to breed in sickly tissues.

Peglion (V.). **Produzione e commercio delle Castagne.** [Chestnut production and industry.]—*Ital. agric.*, lxxiv, 7, pp. 479–487, 1937.

In connexion with a statistical survey of the Italian chestnut industry, the writer mentions a decline in production amounting to about 1,000,000 quintals between 1910 and 1934 as a result of the ink disease [*Phytophthora cambivora*: *R.A.M.*, xv, p. 617 and next abstract].

Petri (L.). **La difese fitosanitaria e la ricostituzione dei Castagneti.** [The phytosanitary defence and the reconstitution of Chestnut groves.]—*Ital. agric.*, lxxiv, 7, pp. 489–494, 3 figs., 1937.

A summary is given of the available information on the ink disease of chestnuts (*Phytophthora cambivora*) [see preceding abstract] and the work in progress in Italy on its control by preventive, curative, and legislative measures, and more especially by the gradual extension of the Japanese *Castanea crenata*, of which 2,575 were planted in experimental sites between 1925 and 1933. Other fungal parasites of the chestnut are of no great economic importance; the spread of *Coryneum perniciosum* [*C. modonium*, the conidial stage of *Melanconis modonia*: *R.A.M.*, vi, p. 6] may be prevented by the excision and burning of diseased branches before the spores have time to mature.

Défago (G.). **Cryptodiaporthe castanea (Tul.) Wehmeyer, parasite du Châtaignier.** [*Cryptodiaporthe castanea* (Tul.) Wehmeyer, a parasite of the Chestnut.]—*Phytopath. Z.*, x, 2, pp. 168–177, 6 figs., 1937.

Cryptodiaporthe castanea (the ascigerous stage of *Fusicoccum castaneum*) [*R.A.M.*, vi, p. 5] was responsible for extensive mortality among young chestnuts of an improved Ticino variety in a planting in Valais, Switzerland. The fungus developed in the cortex and produced sunken cankers that gradually encircled the stem and caused its sudden collapse. The perithecial stage agrees in the main with the description of Wehmeyer [ibid., xiii, p. 270]. The pycnidia arise from locules in a greenish-grey ectostroma composed of parallel hyphae arranged perpendicularly to the stem axis and the hyaline, oval to elongated pycnospores are borne on short, simple, fusoid sterigmata dotted over the inner surface of the locules and measure 4 to 9 by 1·5 to 3·5 μ (mean $6{\cdot}6 \pm 0{\cdot}75$ by $2{\cdot}3 \pm 0{\cdot}44$ μ) on the host. Under very humid conditions the entire black, coriaceous paraplectenchyma ruptures, and exposes the gelatinous sporogenous layers.

Both pycnospores and ascospores germinate rapidly in culture and produce a chestnut-brown mycelium consisting of hyphae, 3 to 4 μ in

diameter, and ovoid pycnidia with a coating of greyish hyphae, a brown, irregular, apical ostiole, a central prosenchyma extending towards the base, and a black peripheral paraplectenchyma as in nature. Locules occupy the entire centre of the pycnidium and produce spores slightly more elongated and less regular than those occurring on the host. On an inclined slope culture *C. castanea* assumes an exceptional habit of growth: the production of aerial hyphae suddenly ceases, whereas the submerged mycelium continues to grow and forms fresh aerial hyphae 5 to 8 mm. lower down, so that the slope appears to be intersected by transverse bands. This remarkable property, which is apparently independent of light and temperature, is gradually lost.

Inoculation experiments with pycno- and ascospore cultures of the fungus on hazel-nut (*Corylus avellana*) and chestnut gave positive results on the latter only (28 out of 30). The host is actively penetrated, probably through a wound or dead bud. However, on vigorous stems the cankers only grow in a longitudinal direction and many are completely arrested by callus formation unless adverse factors supervene to weaken the natural resistance of the host. Control should consist in the avoidance of unfavourable environmental conditions, careful selection and preparation of the soil, and the removal of infected stems at least 15 cm. below the canker.

Wallace (G. B.). **Notes on the susceptibility of indigenous trees to Armillaria.**—*E. Afr. agric. J.*, III, 1, pp. 49–51, 1937.

An annotated list is given of 21 forest trees in the Usambara Mountains, Tanganyika Territory, whose dead roots after felling showed infection by *Armillaria* [*mellea*: *R.A.M.*, xv, p. 746; xvi, p. 564], the native and botanical names of the hosts being given. The fungus has been found attacking only a few living trees, namely, *Trema guinensis*, *Chlorophora excelsa*, and a species of *Acacia* in Tanganyika and *Bauhinia* sp., *Erythrina* sp., and *Ficus* sp. in Uganda. *Ocotea usambarensis* appears to be resistant, many roots up to 20 years old having been found free from infection.

Sarejanni (J. A.). **Un parasite nouveau du Caroubier.** [A new parasite of the Carob tree.]—*Ann. Inst. phytopath. Benaki, Greece*, ii, 1, pp. 53–56, 2 pl., 1936 [issued 1937].

Young pods of *Ceratonia siliqua* growing in Crete and atrophied or deformed as a result of infestation by the Cecidomyid *Eumarchalia gennadii* Marchal showed the presence in close proximity to the insect punctures of immersed, later erumpent, globose-depressed, black, ostiolate pycnidia, 150 to 300 μ in diameter, either densely crowded or else sparsely present on a hard, round, raised, circular, necrotic lesion. The pycnidial walls bore numerous filiform, hyaline sterigmata 21 to 25 μ long, bearing at the extremity a straight, ovoid, later ellipsoid or fusiform, subsequently subcylindrical spore measuring 9 to 17 by 4·5 to 7 μ when unicellular, and 16 to 20 by 5 to 6 μ when bicellular (10 to 25 by 6·7 μ and 25 to 30 by 5·5 to 7 μ, respectively, in culture), usually hyaline, but occasionally a very light, scarcely perceptible yellow. Though showing some resemblances to *Diplodina*, the author regards the fungus as a new species of *Diplosclerophoma* and names it *D.*

(*Diplodina*) *ceratoniae* n.sp., with a Latin diagnosis. It is apparently a wound parasite.

Christensen (C. M.). **Cephalosporium canker of Balsam Fir.**—*Phytopathology*, xxvii, 7, pp. 788–791, 2 figs., 1937.

Balsam firs (*Abies balsamea*) in Minnesota and Wisconsin are liable to infection by a species of *Cephalosporium* causing the development on the cortex of oval or elliptical, slightly sunken cankers, commonly but not invariably originating at branch stubs and exuding resin from broken blisters. A brown discoloration of the underlying bark may extend into the wood through one or two annual rings and sometimes covers a larger area in the wood than in the bark, probably indicating a more rapid progress of the fungus in the former region. None of the cankers observed were apparently more than three or four years old and they occur most frequently on suppressed trees 3 to 5 in. in diameter. In an inoculation experiment on three healthy *A. balsamea* trees with the organism isolated from such cankers the spread of infection was unusually rapid, one canker attaining a length of 12 in. in a year and extending about a quarter of the way round a 5-in. tree, while the smallest tree, 3 in. in diameter, was practically girdled by two cankers.

On malt agar at 20° to 30° C., the colonies of the fungus are faintly zonate, and the mycelium white and flocculent. The minimum, optimum, and maximum growth temperatures appear to be 0°, 27° to 30°, and 35°, respectively. The elongate-oval conidia, sometimes pointed at the base or unilaterally flattened, measure 2·8 to 5·7 μ in length and are produced in 'heads' of 5 to 20 (average 7 to 10), either on short sterigmata or directly on simple or uni- to quadriverticillate conidiophores, 10 to 90 μ in length (average 20 to 40 μ). There is insufficient evidence to identify the species under observation with *C. album*, described by Saccardo as occurring on dead pine branches, and the former may possibly be new to science.

Rubner (K.). **Schüttebefall an Kiefern verschiedener Herkunft.** [Needle fall on Pines of diverse origin].—*Tharandt. forstl. Jb.*, lxxxviii, 4, pp. 289–293, 3 graphs, 1937.

In 1934, Carpathian (pre-war Hungarian) pine seedlings in an experimental planting at Tharandt, Saxony, showed 90 per cent. infection by needle fall [*Lophodermium pinastri*: *R.A.M.*, xii, p. 604], the corresponding figures for those from a German moorland, Upper Franconia, Tharandt, and the Black Forest being 6, 24, 51, and 80 per cent., respectively. In the following year the condition of the trees began to improve and by 1936 it was possible to estimate the position as regards the health of the survivors. Of the Upper Franconian seedlings about 90 per cent. were sound, followed by those of moorland and local origin (*c.* 63 per cent. healthy), while only about 36 per cent. of the Carpathian and Black Forest pines were fit to be retained, the former being even more sickly than the latter. The resistance of the Upper Franconian material to *L. pinastri* is particularly gratifying in view of its adaptability to the conditions obtaining in high elevations in Saxony.

Liubarski (L. V.). Сосновая губка **(Trametes pini Fr.)** в ДВК. [The Pine fungus (*Trametes pini* Fr.) in the Far East.]—*Bull. Far Eastern Br. Acad. Sci. U.S.S.R., 1936*, 21, pp. 113–123, 3 diags., 2 graphs, 1936. [English summary. Received October, 1937.]

Trametes [*Fomes*] *pini* [*R.A.M.*, xvi, p. 357] is stated to be one of the most common parasites of conifers over the whole extent of the U.S.S.R.; in the Far East, in particular, it causes widespread and severe decay of the three most important species, namely, *Picea yezoensis* Carr., *Pinus koraiensis*, and *Larix dahurica*, the last-named also being attacked in Saghalien Island. *P. sylvestris* was found to be infected only sporadically, and *P. funebris* is apparently immune.

Field observations and controlled experiments showed that the mycelium of *F. pini* remains active for as long as five years in *P. yezoensis* logs stacked under damp conditions, but that infected wood of this species gives fairly long service in well aerated and dry buildings, where it may be safely used, especially as the physical properties of the wood are not much lowered in the initial stages of the decay caused by this fungus.

Plant importation rules, Malaya, in force from 1936.—Dep. Agric., S.S. & F.M.S., 38 pp., [1937.]

This is a collection of leaflets showing the plant importation rules in force since 1936 in the Federated Malay States, Straits Settlements, Johore, Kedah, Kelantan, Trengganu, and Perlis. Under the Plant Importation Rules, 1936, Gazette Notification No. 1485 of 29th May, 1936, the importation into Malaya (except from a Malay State) of the following plants is forbidden unless accompanied by a certificate of health and the written sanction of the Director of Agriculture or the Chief Field Officer: Pará rubber (all species of *Hevea*), cotton (all species of *Gossypium*), sugar-cane, coco-nut seed nuts, living and growing palms of all species, oil palm (*Elaeis* spp.) seeds, all species of *Coffea*, except dried beans for consumption or trans-shipment, banana suckers for planting from all sub-species and varieties of *Musa sapientum*, *M. cavendishii* or *M. chinensis*, *M. paradisiaca*, and *M. textilis*, living plants and seeds of tea, and all living parts of pineapple excluding pineapple fruits from the Dutch East Indies for consumption or tinning.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Service and regulatory announcements, January to March, 1937.—pp. 24, 40–81, 1937.

Evidence having been furnished by the Latvian Government as to the absence from Latvia of potato wart [*Synchytrium endobioticum*] and other injurious diseases unknown or not widely prevalent in the United States, Latvia has been added to the list of countries whence potatoes may be imported into the United States [*R.A.M.*, xvi, p. 352] on production of an official permit.

Summaries are given of the plant quarantine import restrictions in force in Mauritius [ibid., xvi, p. 350], the Gambia [ibid., xvi, p. 351], U.S.S.R. [ibid., xv, p. 399], Argentina [ibid., xvi, p. 144], Hungary [ibid., vi, p. 192], Ceylon [ibid., iv, p. 191], and the Dutch East Indies.

INDEX OF AUTHORS

GENERAL INDEX

PRINTED IN
GREAT BRITAIN
AT THE
UNIVERSITY PRESS
OXFORD
BY
JOHN JOHNSON
PRINTER
TO THE
UNIVERSITY